MULTIMARKET TRADING OF CROSS-LISTED STOCKS:

LIQUIDITY, INVESTOR PROTECTION, AND EXCESS COMOVEMENT IN RETURNS

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My dissertation studies the influence of global institutional investors on liquidity distribution and excess comovement in returns for cross-listed stocks around the world. Furthermore, my dissertation investigates the impact of investor protection change on the liquidity distribution of cross-listed stocks.

Chapter 1 studies how global institutional investors' selection of trading venues influences the liquidity distribution of cross-listed stocks on 19 target ("host") markets around the world. I document strong empirical evidence indicating that institutional investors gravitate towards markets that are more geographically, culturally, and economically proximate. However, institutional investor's familiarity preference abates in the selection of trading venues when the target exchange does not furnish detailed rules on trading practices.

Chapter 2, co-authored with G. Andrew Karolyi, studies the impact of abrupt change in the U.S. investor protection laws on the location of stock trading for firms with U.S. cross-listings. The U.S. Supreme Court's ruling in the case of *Morrison vs. National Australia Bank* in June 2010 communicates that civil liability for securities fraud applies only to securities listed on U.S. markets and to security transactions taken place in the U.S. We investigate whether and how the

trading volume distribution of U.S. cross-listed stocks changed around the U.S. Supreme Court's ruling on the Morrison case. Our results indicate that for U.S. cross-listed foreign firms, the U.S. market share of trading volume has increased after the Morrison decision.

Chapter 3, co-authored with G. Andrew Karolyi, examines the influence of global institutional investors on excess comovement in stock returns using cross-listed stocks around the world. We find that the return differentials between the cross-listed and its ordinary home market share, though small, exhibit excess comovements relative to market index returns, the home and the target market returns. Furthermore, we examine whether institutional investors exert significant influence on excess comovement in the returns of long-short positions that consist of a cross-listed and its counterpart home market shares with respective market index returns. We find that institutional investors domiciled in home country intensify the excess comovement in long-short position returns with the home market returns.

BIOGRAPHICAL SKETCH

Seung Won Woo graduated from Hamilton College with Bachelor of Arts degree in economics in 2000. He began his doctoral studies in economics at Cornell University in August, 2007. He joined the U.S. Securities and Exchange Commission in August, 2013.

To my parents

Chung Wha Young and Woo Jong Inn

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CHAPTER 1

MULTIMARKET TRADING AND LIQUIDITY AROUND THE WORLD: WHERE DO GLOBAL INSTITUTIONAL INVESTORS TRADE?

1.1 Introduction

Many firms around the world choose to cross-list their shares globally. Managers at corporations, investors, and academics have studied and weighed various sources of cross-listing benefits [Karolyi (2006); Gagnon and Karolyi (2012)]. According to Mittoo (1992), Fanto and Karmel (1997), and Bancel and Mittoo (2001), both investors and corporate managers often quoted enhanced trading environment as one of the primary motivations and benefits for listing shares on overseas markets. Empirical evidence suggests that there is a dramatic increase in trading volume and turnover rates both at the home and at the US market around the US listing of foreign shares [Smith and Sofianos (1997); Foerster and Karolyi (1998); Halling, Pagano, Randl, and Zechner (2008)]. An important question is whether trading activity of all cross-listed shares on the overseas markets persists after the cross-listing and what determines where stock trading is likely to take place between the home market and the new "host" (or target) market. These issues are relevant to all corporate managers who already listed their shares and are looking to cross-list on foreign markets, to stock exchanges, which compete with one another for order flow among existing listings and for new listings, and to broker dealers who have commercial interests in facilitating trades of existing and newly listed shares.

Furthermore, cross-border investment has increased during the past two decades, and it has become an indispensable part of investor portfolios around the world. In general, restrictions and barriers on capital flows across national borders have steadily been lowered throughout the last three decades [Karolyi and Stulz (2003)]. Understanding the dynamics of multimarket trading is important to global institutional investors as these institutional investors have greater freedom in selecting trading venues. In particular, it is important to global institutional investors who are faced with choices of where to trade securities with cross-listings and who engage in multimarket trading for arbitrage.

In this paper, I examine the factors that explain the trading volume distribution of cross-listed securities. My results suggest that investor familiarity bias and ambiguity aversion exert significant influence on the selection of trading venues. Using a sample of 1,953 globally cross-listed securities on 19 target ("host") markets around the world, I show that institutional investors are drawn to markets that are more "proximate": the target market share of trading volume is larger for the firms primarily owned by institutional shareholders who are more geographically, culturally, and economically proximate to the target market than to its counterpart home market. Additionally, I find that the target market rules governing trading practices play important role in determining the trading volume distribution of cross-listed securities. I document strong empirical evidence indicating that the influence of institutional investor familiarity bias lessens in the selection of trading venues when the target market does not furnish detailed exchange trading rules (greater ambiguity).

This paper makes important contributions to the existing empirical research on multimarket trading dynamics. First, I examine the importance of investor familiarity bias in the selection of trading venues. There are a multitude of articles that examine the importance of investor proximity preference in investing decisions and financing decisions.[1] There is strong empirical evidence from “home bias” literature that geographical and time zone proximity and familiarity in language and culture matter in portfolio holding and investing decisions.[2] Sarkissian and Schill (2004) show that geographical, economic, cultural, and economic proximity play dominant role in overseas listing and financing decisions.

Both Baruch et al. (2007) and Halling et al. (2008) evaluate factors related to investor familiarity in the context of multimarket trading. Unlike in these previous studies, I do not simply measure familiarity between home and target markets in my analysis. I take who the market participants are into account. In trading cross-listed shares, global institutional investors are faced with choices in trading venues. Specifically, my focus is on whether institutional investor’s familiarity bias influences the location of stock trading.

Secondly, this article investigates whether investors are averse to trading in markets that do not furnish detailed market rules governing trading practices (greater ambiguity). To the best of my knowledge, there is no empirical work that examines the importance of investor ambiguity aversion in the selection of trading venues. A long line of research suggests that ambiguity aversion is one of the major factors that affect investor participation.[3] Easley and O’Hara (2010) demonstrate how certain microstructure features, such as market rules, trading systems, and

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[1] Brennan and Cao (1997); Kang and Stulz (1997); Coval and Moskowitz (1999, 2001); Hau (2001); Huberman (2001); Grinblatt and Keloharju (2001); Sarkissian and Schill (2004); Chan, Covrig, and Ng (2005).
[2] Coval and Moskowitz (1999); Grinblatt and Keloharju (2001); Chan, Covrig, and Ng (2005); Warnock and Cleaver (2001); Ahearne, Griever, and Warnock (2004); Kang and Stulz (1997).
[3] Dow and Werlang (1992); Epstein and Wang (1994); Easley and O’Hara (2009); Easley and O’Hara (2010).

trading procedures, can reduce perceived ambiguity and thereby induce investor and issuer participation in markets. This has immediate implications for stock exchanges, which compete with one another for trading volume and new listings. Easley and O'Hara (2010) offers a prediction that stock exchanges with better (less ambiguous) market rules host greater liquidity and larger trading volume.

In this paper, I examine whether institutional investors avoid trading in markets with ambiguous (less detailed) market rules regulating trading practices even if institutional investors are familiar with them. Linking investor familiarity bias and ambiguity aversion is appropriate as what institutional investors find ambiguous market rules depends on what they are "used to." Suppose you are a sophisticated institutional investor from a country with ambiguous market rules and you are "familiar with" trading and dealing with ambiguous market rules. In this case, you may be equally comfortable trading in some other markets with familiarly ambiguous market rules. However, even if institutional investors are familiar with trading in markets with ambiguous market rules, these institutional investors may choose to avoid trading in these markets. On the other hand, if you are an institutional investor from a country with good (less ambiguous) market rules, then you may not be willing to delve into trading in a market with ambiguous rules governing trading practices.

Thirdly, I extend the earlier studies of Baruch et al. (2007) and Halling et al. (2008) by examining firm and market level factors that influence the trading volume distribution of cross-listed shares on non-US target ("host") markets, and also for cases, which there are more than one competing target markets for trading volume. The bulk of empirical research on multimarket trading dynamics of cross-listed securities primarily draws samples from cross-listed securities on one target market, the US market, and ignores potential competition among multiple target markets.[4] Little is known about the relative importance of factors that determine the trading volume distribution of cross-listed securities on non-US target markets. My sample consists of 2,226 unique exchange listed securities on 19 target markets around the world: 1 stock exchange from Africa, 5 stock exchanges from Asia, 4 stock exchanges from Americas, and 9 European bourses. Moreover, of 2,226 securities in the sample, three hundred seventy one (371) of these securities have cross-listings on multiple target markets. My sample provides greater cross-section of target markets to study the factors that influence the multimarket trading dynamics of cross-listed securities.

The remainder of this paper is organized as follows. Section 1.2 describes the sample and cross-border listing trends. Section 1.3 discusses familiarity bias and ambiguity aversion hypothesis. Section 1.4 reports the summary statistics. Section 1.5 reports the empirical results. In Section 1.6, using the Directive on Markets in Financial Instruments (MiFID), I re-examine the influence of investor familiarity bias and ambiguity aversion on the multimarket trading dynamics of cross-listed securities in an experimental setting where potential endogeneity issues are minimized. Section 1.7 concludes.

[4] Karolyi (2006); Gagnon and Karolyi (2012); Domowitz, Glen, and Madhavan (1998); Pulatkonak and Sofianos (1999); Baruch, Karolyi, and Lemmon (2007); Halling, Pagano, Randl, and Zechner (2008); Cumming, Humphery-Jenner, and Wu (2011); Halling, Moulton, and Panayides (2013).

1.2 Sample description & cross-border listing trend

In this section, I describe the sample and discuss global cross-listing trend. The World Federation of Exchanges provides statistics on the number of foreign listings for stock exchanges around the world. In selecting target (or "host") markets, I pick out stock exchanges that list larger number of foreign securities for each of the four regions, Africa, Americas, Asia, and Europe. This process results in 19 target stock exchanges from 2001 to 2011. These 19 target markets include Johannesburg (Africa), Australia, Hong Kong, Singapore, Taiwan, Tokyo (Asia), Lima, NASDAQ, New York, Toronto (Americas), Euronext Amsterdam, Euronext Brussels, Euronext Lisbon, Euronext Paris, Frankfurt, London, Luxembourg, Oslo, and Swiss (Europe). I only consider exchange listed securities. The London Stock Exchange listings include foreign listings on Alternative Investment Market (AIM) but not SEAQ International as securities traded on SEAQ are not exchange listed securities. The Singapore Stock Exchange data includes listings on SESDAQ. The listings on the TSX Venture are a part of the Toronto market sample. My Euronext samples include listings on Alternext markets. The New York Stock Exchange sample includes listings on AMEX. For the Frankfurt sample, I only consider foreign securities listed under prime standard, general standard, and entry standard. I ignore all foreign listings on OTC markets.

I use Datastream stock universe to construct the sample of cross-listed securities. I exclude all securities of special types, such as preferred shares, royalty trusts, and investment funds. I also drop all company stocks domiciled in tax havens. I then identify foreign securities based on the country of incorporation. To seek out cross-listings, I manually match securities listed on target markets with the home market securities using company name, security name, and ISIN codes.

The cross-listed securities sample is further restricted by the availability of weekly price and trading volume data from Datastream. The sample period spans from January 2001 to December 2011. I am left with the final sample of 2,226 unique securities with cross-listings on at least one of the 19 target markets from 60 different home countries.

Table 1.1 shows the distribution of cross-border listings across 19 target exchanges grouped by home region and home country's degree of economic development (developed vs. emerging). I use the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group. There are 2,932 cross-listed securities (secondary listings) during the period between January 2001 and December 2011. The London Stock Exchange hosts the largest number of cross-listings, 880. The London Stock Exchange hosts more cross-listings than the NASDAQ and the New York Stock Exchange combined, 700. The Euronext Lisbon is the smallest host market with only 5 cross-listings. Most target markets draw a larger number of cross-listings from countries geographically close. This is consistent with the findings of Sarkissian and Schill (2004). Sarkissian and Schill (2004) finds that geographical proximity plays an important role in the choice of overseas listing venues. Furthermore, approximately 85% (2,491 out of 2,932) of cross-listings come from companies domiciled in developed countries. The majority of cross-border listings from the developing world originates from companies domiciled in emerging Americas and emerging Asia. Companies from emerging Americas mainly cross-list their shares on the New York Stock Exchange. On the other hand, cross-listing destinations for firms domiciled in emerging Asia are more diverse; the share of Asian, American, and European target markets are about 40% (80 out of 199), 21% (42 out of 199), and 39% (77 out of 199), respectively.

Table 1.2 describes cross-listing trend over the last decade. The number of cross-listings decreased over the past decade, from 1,802 in 2001 to 1,221 in 2010. In particular, the cross-border listings on the European target markets diminished over time. This decrease is rather dramatic. The decrease in the number of cross-listed shares on European targets is on average 60% from 2001 to 2010. Contrastingly, the number of cross-listings on the Asian target markets has increased over the last decade with the exception of Tokyo. The Hong Kong and the Taiwan Stock Exchange are the notable gainers. Among the North American target markets, the Toronto Stock Exchange experienced a large increase in cross-listings from 32 listings in 2001 to 66 in 2010.

My sample includes firms that cross-list on multiple target markets. Table 1.3 presents the distribution of multiple cross-listings across 19 target markets for selected years. Of 2,226 securities with cross-listings, three hundred seventy one (371) of these securities have cross-border listings on multiple target bourses. Some firms have a maximum of 8 cross-listings in some years. The cross-listing on multiple target markets has decreased over the last decade. This decrease is more evident during the latter half of the sample period, mainly after 2005. There are a total of 1,033 cross-listings with no other secondary listing on any other target bourses in 2001, and a total of 368 cross-listings with exactly 1 other secondary listing on other host markets, 172 secondary listings with 2 other cross-listings, 89 cross-listings with 3 other cross-listings, and 140 secondary listings with 4 or more other cross-listings in 2001. There are about the same number of secondary listings, 958, with no other cross-listing on any other host markets in 2010 compared to in 2001. However, in contrast to this, by 2010, there are only 179 cross-listings with

1 other secondary listing on other host markets, only a total of 42 secondary listings with 2 other cross-listings, 32 cross-listings with 3 other secondary listings, and lastly, only 10 cross-listings with 4 or more other secondary listings. In addition, I observe great variations across different target markets. Most notably, the cross-listed securities on the NASDAQ have only a small number of secondary listings on other target bourses. This is not the case for most European target bourses. European target markets in general are not the sole destination of cross-listing. For instance, there are 25 firms, which came to Euronext Paris to cross-list, with no other secondary listing in 2001. Contrastingly, in 2001, there are 20 firms that secondarily listed on Euronext Paris have 4 or more additional cross-listings on other target bourses.

1.3 Hypotheses & variable construction

My goal is to study the trading volume distribution of cross-listed securities around the world. First, I describe the construction of dependent variable, *target market share of trading*. Secondly, I introduce the "familiarity" bias hypothesis and eight "familiarity" measures. The construction of eight "familiarity" measures is discussed in 1.3.3. Lastly, I discuss the ambiguity aversion hypothesis in this section.

The hypotheses and details of variable constructions for known firm (*bkl* information factor, *size, foreign sales, relative industry capitalization, home market analyst, volatility*) and market (*geographical distance, relative investor protection, relative transaction cost, relative market turnover*) level factors that influence multimarket trading dynamics are discussed in 1.3.5 and 1.3.6. Firm and market characteristic variables are based on the theories of Pagano (1989), Chowdhry and Nanda (1991), Admati and Pfleifer (1988), and Baruch et al. (2007). I also include several known firm and market level explanatory variables from an important empirical paper on multimarket trading, Halling et al. (2008).

1.3.1 *target market share of trading*

The purpose of this article is to examine factors that influence the trading volume distribution of cross-listed securities. I measure the intensity of trading activity in terms of the dollar value of transaction amount (the number of shares traded times the closing price).[5] For each cross-listed security of firm *i* traded on target market *j*, I define *target market share of trading* as the ratio of dollar amount traded on target market *j* (in US dollars) to the total dollar amount traded (in US dollars). The total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market for firm *i*.

$$target\ market\ share\ of\ trading_{ij} = \frac{volume^{tm_j} \times price^{tm_j}}{\sum_l [volume^{tm_l} \times price^{tm_l}] + volume^{hm} \times price^{hm}} \quad [1]$$

where tm_j denotes target market *j*, and *hm* indicates home market. Using data from Datastream, I compute the *target market share of trading* at weekly frequency, and these ratios are averaged over 1 year. I then take the natural log of these annually averaged ratios. My measure of trading volume share improves upon those of Baruch et al. (2007) and Halling et al. (2008). Both Baruch et al. (2007) and Halling et al. (2008) only include the trading volume of US markets and that of home market. They ignore trading activities in other target markets (non-US host markets).

[5] This definition resolves any complications arising from ADR and GDR bundling ratios in measuring trading volume as the price of ADR and GDR account for bundling ratios.

1.3.2 Familiarity bias hypothesis

I examine the importance of investor "proximity" or "familiarity" bias in trading decisions. In the world of cross-listed securities, investors may select where to trade those cross-listed shares. Investors, at a minimum, have an option to trade the same security either in the target market or in its home market. Investors may have more than two choices of trading venues if the security is listed on multiple host markets. Among investor groups, institutional investors are the ones who have the experience and the means to trade in foreign markets with greater freedom whereas retail investor trading may be more confined to their local markets. My focus is on testing whether global institutional investors exhibit "proximity" or "familiarity" bias in the selection of trading venues. Would global institutional investors be "pulled to trade" in markets with which they are more familiar?

The literature suggests geographic, cultural, regulatory, and economic "proximity" or "familiarity" play dominant role in financing and portfolio holding decisions.[6] I consider eight "proximity" proxies: geographical distance, language, colonial heritage, legal origin, bilateral trade, exchange trading rules, investor protection, and accounting standards. More specifically, I investigate whether institutional investor's relative proximity to home and target markets influence the trading activity distribution of cross-listed securities. The institutional investor's country of domicile is the reference point in measuring proximity to the target and to the home market (country) of cross-listed security. For each cross-listed security and each sample year, I

[6] Coval and Moskowitz (1999); Grinblatt and Keloharju (2001); Chan, Covrig, and Ng (2005); Warnock and Cleaver (2001); Ahearne, Griever, and Warnock (2004); Kang and Stulz (1997); Sarkissian and Schill (2004).

construct familiarity "distance" measures to estimate how "far away" institutional investors are in aggregate from the target and also from the home market (country), respectively. For each familiarity proxy and each firm *i* in each sample year *t*, I define the *familiarity distance* measure as:

$$familiarity\ distance_{i,t,home} = \sum_k |distance\ to\ the\ home\ \ market|_{k,t} \times ownership_{k,t} \quad [2]$$

$$familiarity\ distance_{i,t,target} = \sum_k |distance\ to\ the\ target\ \ market|_{k,t} \times ownership_{k,t} \quad [3]$$

where $ownership_{k,t}$ is the percentage of firm's market capitalization held by institution *k* at the end of year *t*. By construction, the distance between the home market (country) of cross-listed security and the institutional investors domiciled in the home country of cross-listed security is 0 in [2]. Similarly, the institutional investors domiciled in the target country of cross-listed security have distance 0 in [3]. Intuitively, the *familiarity distance* measure may be thought of as the weighted (institutional ownership acting as weights) average "distance" of institutional shareholder base either to target or home market (country). I then take the difference between [2] and [3] to create the *relative distance* variable for each of the eight aforementioned proximity proxies and for each sample year *t*.

$$relative\ distance_{i,t} = familiarity\ distance_{i,t,home} - familiarity\ distance_{i,t,target} \quad [4]$$

The *relative distance* variable measures how much “closer” institutional investors are to the target compared to the counterpart home market. If “proximity” is the dominant concern for trading venue selection to global institutional investors, then I expect the *relative distance* variables to be positively associated with the target market share of trading volume.

It would be ideal to have global institutional investor trading record at the transaction level. However, transaction level datasets are often proprietary in nature. I instead use FactSet Global Institutional Ownership database.[7] One notable advantage of using FactSet Global Institutional Ownership database is that FactSet Global Institutional Ownership database has a comprehensive coverage of global institutional ownership around the world unlike Thomson Financial’s 13F database, which only includes US institutional ownership.[8] Both Baruch et al. (2007) and Halling et al. (2008) rely on 13F database as their only source of institutional ownership data. I use year-end values (December 31) of institutional investor ownership. The construction of familiarity measures is discussed in the next section, 1.3.3.

1.3.3 Familiarity measures

I discuss the construction of familiarity measure in this section. In computing [2] ([3]) (in Section 1.3.2), the geographical distance is the distance (in ten thousand miles) between the city

[7] FactSet Global Institutional Ownership dataset is only used in a few studies: Bartram, Griffin, and Ng (2010) and the papers co-authored mainly by Ferreira and Matos.

[8] Bartram, Griffin, and Ng (2010) and Ferreira and Matos (2008) provide detailed discussions on the institutional investor coverage of the FactSet Global Institutional Ownership database.

in which the target (home) market is located and the city that hosts the major stock exchange(s) of the institutional investor's domicile country. For colonial heritage, I assign the distance to be 1 in calculating [2] ([3]) (in Section 1.3.2) if the target (home) country and the institutional investor's country of domicile do not share the common colonial heritage, and the distance is 0 otherwise. I use the same methodology in assigning the distance for legal origin and language. I consider up to 5 official languages in matching a common language between the target (home) country and the institutional investor's country of domicile. The data for language and colonial heritage come from the CIA World Factbook.

For bilateral trade, I sum the annual imports and exports (the total trade amount in current US dollars) of the institutional investor's domicile country from and to the target (home) country. I scale this total trade amount by the nominal GDP of the institutional investor's domicile country. I attach the minus sign to the scaled bilateral trade to account for the intuition that the larger the value of bilateral trade, the more economically proximate the two countries are. The dyadic trade values are constructed from IMF trade data. For each measure of exchange trading rules, investor protection, and accounting standards, I measure the distance by taking the absolute values of the difference between the target (home) country score and that of the institutional investor's domicile country.

Cumming, Johan, and Li (2011) provides exchange trading rule scores for 45 stock exchanges around the world. I define the exchange trading rules index to be the equally weighted average value of the market manipulation, insider trading, and broker-agency index from Cumming, Johan, and Li (2011). When there is more than one major stock exchange in institutional investor's country of domicile, I take the average of exchange rule measures among the major stock exchanges in computing the distance for exchange rules. The investor protection index and the accounting standards data are obtained from La Porta, Lopez-de-Silanes, and Shleifer (2006) and La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998), respectively. The investor protection index is the principal component of disclosure requirements, liability standards, and anti-director rights.

1.3.4 Ambiguity aversion hypothesis

I next investigate whether global institutional investors are averse to trading in markets that do not furnish detailed market rules governing trading practices (greater ambiguity) and thereby influencing the trading activity distribution of cross-listed securities. Institutional investors are likely to have greater freedom in selecting trading venues. At the same time, global institutional investors may be drawn to trade in markets with trading rules with which they are more familiar. If an institutional investor is used to trading in markets with detailed market rules, then this institutional trader may be reluctant to trade in other markets with unfamiliarly ambiguous (less detailed) market rules. If you are an institutional investor who is used to dealing with ambiguous market rules, then you may be comfortable trading in other markets with ambiguous rules. However, in trading cross-listed shares, institutional investors may have options to go to the markets with less ambiguous market rules to trade the exact same security. I test whether institutional investors avoid trading in a market with ambiguous (less detailed) market rules governing trading practices even if these sophisticated institutional investors are familiar with them given choices among trading venues.

To test my ambiguity aversion hypothesis, I consider a subset of variables used to proxy investor familiarity: exchange trading rules, investor protection law, and accounting standards. Investor protection law and accounting standards may proxy the quality of market rules: stock exchanges alone may not be able to overcome ambiguities arising from a country's legal and regulatory system. Easley and O'Hara (2009) show how a country's legal system and regulation (especially regulation of left-tail events) can diminish the effect of ambiguity, by that inducing investor participation in financial markets. Investor protection law and accounting standards are two of the measures that adequately reflect a country's legal system and regulations. To account for the importance of legal system and regulation at a country level, I include investor protection law and accounting standards in the analyses.[9]

I note that three aforementioned variables (exchange trading rules, investor protection law, and accounting standards) can be ordered. All three variables are numeric measurements: the more detailed the regulations/rules, the higher the values for each of three aforementioned measures. Using each of three market rule measures, I classify target markets into two categories: the markets with detailed rules and the markets with ambiguous rules. I create target market dummy variables based on the categorization. For each market rule,

$$tm\ low\ (market\ rules) = 1\ if\ market\ rules\ \leq\ \alpha, and\ 0\ otherwise.$$

[9] Cumming, Johan, and Li (2011) provides exchange trading rule scores for 45 stock exchanges around the world. I define the exchange trading rules index to be the equally weighted average value of the market manipulation, insider trading, and broker-agency index from Cumming, Johan, and Li (2011). The investor protection index and the accounting standards data are obtained from La Porta, Lopez-de-Silanes, and Shleifer (2006) and La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998), respectively. The investor protection index is the principal component of disclosure requirements, liability standards, and anti-director rights.

where *market rules* are exchange trading rules, investor protection law, and accounting standards. The α values for exchange trading rules, investor protection law, and accounting standards are 0.13, 6, and 69, respectively. For these α values, approximately 25% to 30% of the observations in the sample are from the target markets that feature ambiguous (less detailed) market rules.

Easley and O'Hara (2009, 2010) predicts that ambiguous market rules limit investor participation in financial markets. This translates to lower target market share of trading volume for the target markets with ambiguous market rules. I also generate interaction terms by interacting the *tm low (market rules)* with the corresponding familiarity *relative distance* variable. If institutional investors avoid trading in target markets with ambiguous market rules even though these institutional investors are familiar with them, then I expect to observe a negative relation between the interaction terms and the target market share of trading volume.

1.3.5 Known firm-specific factors

bkl factor

Baruch et al. (2007) develops a multimarket trading model (the BKL model hereafter) to explain cross-sectional variations in the foreign share of trading activity of cross-listed stocks. Empirically, the *bkl* information factor represents the incremental contribution of target market returns in explaining the firm's stock returns over and above the portion captured by the firm's home market returns. I adjust *bkl* factor estimation to account for the cases where a firm's stock is cross-listed on multiple target bourses. For securities with cross-border listings on multiple host markets, the *bkl* factor measures the incremental contribution of host market returns in explaining the firm's stock return variations in addition to the firm's stock return information contained in the firm's home and other host market returns. To compute *bkl* measures, for each cross-listed security of firm *i* traded on target market *j*, I estimate the following two time-series regressions:

[Restricted model (R)]:

$$R_{it} = \alpha_i + \sum_{k=-1}^{+1} \beta_{i,hm,t+k} R_{hm,t+k} + \sum_{\sim j} \sum_{k=-1}^{+1} \beta_{i,tm_{\sim j},t+k} R_{tm_{\sim j},t+k} + \varepsilon_{it} \qquad [5]$$

and

[Unrestricted model (UR)]:

$$R_{it} = \alpha_i + \sum_{k=-1}^{+1} \beta_{i,hm,t+k} R_{hm,t+k} + \sum_{\sim j} \sum_{k=-1}^{+1} \beta_{i,tm_{\sim j},t+k} R_{tm_{\sim j},t+k} + \sum_{k=-1}^{+1} \beta_{i,tm_j,t+k} R_{tm_j,t+k} + \varepsilon_{it} \qquad [6]$$

where R_{it} is the total return (measured in US dollars) of firm *i* in period *t*, $R_{hm,t+k}$ is the total return (measured in US dollars) on the market index in the firm *i*'s home country in period *t+k*, $R_{tm_j,t+k}$ is the total market index return (measured in US dollars) of target market *j* in period *t+k*, and $R_{tm_{\sim j},t+k}$ is the total market index return (measured in US dollars) on other target markets (other than target market *j*) with firm *i*'s cross-listings in period *t+k*. The lead and lag terms are included in the above time-series regressions to account for nonsynchronous trading across markets located in different time zones. The *bkl* measure is an *F*-statistic that quantifies the explanatory power of the unrestricted model (UR) relative to that of the restricted model (R). The *bkl* factor is defined as:

$$bkl = \frac{(R_{UR}^2 - R_R^2)/3}{(1 - R_{UR}^2)/(n - p + 1)} \qquad [7]$$

where *n* is the number of observations, and *p* is the number of parameters to be estimated in the unrestricted model (UR). The *bkl* factor is computed using weekly total return series from Datastream. I use the total return series of Datastream country index for home and target market returns. For each sample year and for each security with up to 2 secondary listings, I require at least 120 weeks of past total return data in computing *bkl*. I require 160 weeks of past total return series for securities with 3 to 5 secondary listings. To obtain reasonably precise estimates of the *bkl* factor for cross-listed shares with more than 5 secondary listings, I require a minimum of 200 weekly past total return data. The BKL model predicts that the higher the return correlation of the cross-listed security with other securities listed on the target market, the larger the target market share of trading volume. I expect the *bkl* factor to be positively associated with the *target market share of trading*.

1.3.5 Known firm-specific factors (cont'd)

{*size, foreign sales, relative industry capitalization, home market analyst, volatility*}

Firm level information environment is likely to influence the trading volume distribution of cross-listed shares. Firm *size* may proxy for the visibility of the firm to target market investors. Larger market capitalization may indicate that the firm is better known to the investors in the target market. I control for firm *size* using the natural logarithm of the stock's annual average market capitalization in US dollars from Datastream. Furthermore, I include the percentage of firm's *foreign sales* as it may capture how well-known the firm is to the target market investors [Kang and Stulz (1997), Baruch et al. (2007), and Halling et al. (2008)]. I collect the percentage of *foreign sales* data annually from the Worldscope (item WC08731). As another proxy for the firm visibility to the target market investors, I consider the difference between the percentage of global industry market capitalization for the firm's industry in the target market and the percentage of global industry market capitalization for the firm's industry in the home market (*relative industry capitalization*) [Baruch et al. (2007)]. The *relative industry capitalization* variable is constructed using the Level 3 Datastream industry indices data (10 industry groups). I expect the proxies for firm visibility to be positively related to *the target market share of trading*.[10]

Furthermore, higher analyst coverage in the home market may lower information acquisition cost for foreign investors trading in the home market [Baruch et al. (2007)]. This reasoning predicts a negative association between the *home market analyst* coverage and the trading volume share of target market.[11] Following Baruch et al. (2007), I measure the extent of *home market analyst* coverage using the natural logarithm of one plus the number of 1-year-ahead earnings-per-share (EPS) estimates for the home market security. Analyst EPS estimates are from the International Summary data of I/B/E/S, and I use the year-end values (December).

[10] There is little empirical support for the aforementioned hypothesis. In fact, both Baruch et al. (2007) and Halling et al. (2008) find that firm *size* is negatively related to the trading activity in target market.

[11] The extent of analyst coverage in the home market may also proxy for the amount of information available to the general public. This interpretation makes the relationship between the analyst coverage in the home market and the target market share of trading rather unclear.

Halling et al. (2008) shows that the sensitivity to private information affects the distribution of target market share of trading activity. If private information originates in the target market, then investors in the target market may have informational advantage, leading to larger share of trading in the target market. It is shown that firms with higher return volatility are more sensitive to private information. Halling et al. (2008) find a positive association between return *volatility* and the target market trading share. I estimate the return *volatility* as the annual standard deviation of weekly home market security returns using data from Datastream.

1.3.6 Known market-specific factors

{*geographical distance*, *relative investor protection*, *relative transaction cost*, *relative market turnover*}

Literature has shown that geographical proximity plays an important role in information flows [Prinsky and Wang (2006); Coval and Moskowitz (2001); Pulatkonak and Sofianos (1999); Sarkissian and Schill (2004); Baruch et al. (2007); Halling et al. (2008)]. Baruch et al. (2007) and Halling et al. (2008) demonstrate that the closer the US markets to the home market of the firm, the higher the US share of trading activity. I measure geographical proximity in terms of *geographical distance* (in miles) between the target and the home market of the security. I expect a negative relation between the target market share of trading volume and the *geographical distance*.

Halling et al. (2008) argue that investors would prefer to trade on the stock exchanges with stricter and better enforced rules against insider trading as better legal protection against insider trading reduces adverse selection costs for market participants. If this is the case, then we would expect to observe a larger target market share of trading for target markets with better investor protection. To measure the extent of the difference in investor protection (*relative investor protection*) between the target and the home market, I take the difference between the investor protection index score of the target and that of the home market. The values of the investor protection index are drawn from La Porta, Lopez-de-Silanes, and Shleifer (2006).

Transaction costs and liquidity play an important role in the ability of markets to attract trading volume [Chowdhry and Nanda (1991); Domowitz, Glen, and Madhavan (1998)]. Those target markets with lower transaction costs would host a larger portion of trading activity. To account for this, I measure the *relative transaction cost* between the target and the home market using the institutional investors' transaction costs data from Elkins McSherry. I take the annual average of quarterly commission, fees, and market impact costs in basis points for each market in our sample. I then subtract the yearly average transaction costs of trading in the home market from that of at the target market to generate the estimates for the *relative transaction cost*. I expect a negative relation between the *relative transaction cost* and the trading volume share of target market.

Furthermore, I control for the difference in the level of overall market trading activity in regression analyses. I measure the level of overall market trading activity in terms of total turnover scaled (in US dollars) by total market capitalization (in US dollars). I take the annual average of the scaled weekly market turnover. The *relative market turnover* is defined as the difference in the yearly average scaled turnover of the target and that of the home market of the cross-listed security. I use the Datastream country index data to compute the *relative market turnover*.

1.4 Summary statistics

I present the trading volume distribution of cross-listed securities across 19 target markets in Table 1.4. The *target market share of trading* is the ratio of weekly dollar amount traded on target market (in US dollars) to the weekly total dollar amount traded (in US dollars) averaged over 1 year. The total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market of the firm. Table 4 summarizes the average *target market share of trading* for each of the 19 target markets grouped by home region and home country's degree of economic development (developed vs. emerging). The average values are calculated first by averaging over time for each cross-listing and then by computing the average within each target market. The overall mean value for the *target market share of trading* is 18%. There are substantial variations in the *target market share of trading* across target bourses. Among the target exchanges that host larger number of cross-listings, New York (36%), NASDAQ (48%), Australia (22%), and Hong Kong (30%) grab larger share of trading than the overall average. The London Stock Exchange, which hosts the largest number of cross-listings, attracts only 9% of global trading volume. In fact, most European target bourses grab relatively small share of global trading volume. Furthermore, Table 1.4 demonstrates that the *target market share of trading* in general is larger for firms domiciled in the countries geographically closer. This is consistent with the findings of Baruch et al. (2007) and Halling et al. (2008).

Panel A, B, and C of Table 1.5 report the summary statistics of the sample grouped by target markets. All mean values are calculated first by taking the time-series averages of the variables for each cross-listing and then by computing the average within each target market. Panel A of Table 1.5 presents the mean values of firm-specific variables for each target market. The *bkl* is computed using [5], [6], and [7] in Section 1.3.5. The overall sample mean of *bkl* is 1.897. Toronto (2.488), New York (2.187), and NASDAQ (2.222) provide more incremental pricing information for cross-listed securities, on average. Contrastingly, the European financial centers, Frankfurt (1.541) and London (1.541), add relative little price-relevant information for cross-listed shares. Johannesburg furnishes the most and Tokyo provides the least incremental pricing information. The average firm *size* is 17 billion US dollars. Tokyo (58.6), Lima (65.4), and Swiss (45.9) host cross-listings from larger companies. Mainly, these target bourses lists the stocks of large US firms. However, Tokyo, Lima, and Swiss grab a small portion of global trading volume. Baruch et al. (2007) and Halling et al. (2008) find that firm *size* is negatively related to the US share of trading.

Panel B of Table 1.5 shows the averages of market-specific variables for each target bourse. The mean of *relative investor protection* is 0.38, indicating that target markets provide only a little better investor protection compared to their counterpart home markets. Most notably, Singapore, New York, and NASDAQ offer far better investor protection. On the other hand, a majority of European target markets offers worse protection than their counterpart home markets. The average difference in transaction costs between the target market and its counterpart home markets (*relative transaction costs*) is -0.01. This indicates that it is cheaper to trade in the target than in the home markets. US target bourses have the lowest transaction costs compared to their counterpart home markets. The average transaction cost for the London Stock Exchange is higher than in its counterpart home markets.

Panel C of Table 1.5 presents the summary statistics of familiarity *relative distance* measures across target markets. The *relative distance* measures are constructed using [2], [3], and [4] in Section 1.3. The *relative distance* measures how much "closer" institutional shareholders are to the target compared to its counterpart home market. The overall average values of *relative distance* variables are negative with the exception of the *relative distance (bilateral trade)*. This tells us that a typical cross-listing firm has institutional shareholders base that is more proximate to the home markets. All *relative distance* measures are consistently positive for New York and NASDAQ. Firms that cross-list on US target markets attract global institutional traders who are more familiar with US exchanges than their counterpart home markets.

Lastly, Table 1.11 tabulates correlation coefficients of all variables. With the exception of firm *size*, the signs of correlation coefficients on firm and market level variables are consistent with the predictions in Section 1.3.5 and Section 1.3.6. The negative correlation between *target market share of trading* and *size* agrees with the findings of Baruch et al. (2007) and Halling et al. (2008), however. All familiarity *relative distance* measures are positively correlated with *target market share of trading*. The *target market share of trading* is higher when the firm has institutional investor base that is more proximate to the target market than to their counterpart home markets. The *relative distance* variables are highly correlated with each other. The only exception is *relative distance (bilateral trade)*.

1.5 Regression results

To examine the determinants that affect target market share of trading volume, I turn to regression analyses. The dependent variable in the regressions is the logistic transformation of weekly *target market share of trading* averaged over 1 year (defined in [1], Section 1.3).[12] The annual panel includes 9,362 observations (security-target market-year) for 1,953 cross-listed securities ranging from 2001 to 2011. However, the number of observations varies across different regression specifications due to the data availability of explanatory variables. I allow securities to enter and exit the panel over time. Following Baruch et al. (2007) and Halling et al. (2008), all explanatory variables are lagged 1 year in regressions. I estimate pooled ordinary least squares (pooled OLS) regressions with robust standard errors. In all regression specifications, standard errors are robust to heteroskedasticity. Furthermore, I cluster standard errors by firm and by year. This allows for potential correlation among observations of different firms in the same year and for possible correlation among observations on the same firm across different years [Petersen (2009); Cameron, Gelbach, and Miller (2006)].

1.5.1 Baseline results

Table 6 reports the baseline regression estimation results. In Table 1.6, model (1), (2), (3), and (4) are estimated using the entire sample. Models (1) through (4) only differ by the inclusion and exclusion of year and target market fixed-effects. Model (5) is the estimates on the sample of securities with 1 target market in a given year. The estimation result using only the sample of

[12] The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. I compute the *target market share of trading* at weekly frequency, and these ratios are averaged over 1 year. I then take the natural log of these annually averaged ratios.

securities that have cross-lists on more than 1 target market in a given year is labeled model (6). Baruch et al. (2007) and Halling et al. (2008) study multimarket trading dynamics with a sample of firms that cross-list on US markets. To compare the relative importance of factors that influence the trading volume distribution of cross-listed securities listed on US markets versus non-US target markets, I further split the sample into two: one with cross-listings on US markets and the other with cross-listings on non-US target markets. Model (7) reports the estimation result for the firms with US target markets, and model (8) shows the result on the firms that cross-list on non-US host markets. The *institutional ownership* enters regressions as a control. For each firm, the *institutional ownership* is the percentage of the company's market capitalization (in US dollars) owned by institutions. I drop *foreign sales* from all regression specifications. The *foreign sales* variable is mostly statistically insignificant, and the inclusion of *foreign sales* erodes the number of observations.

I take model (2) in Table 1.6, which includes year fixed-effects, to be the base case specification. The estimates of the base case specification are mostly consistent with my hypotheses. All coefficients of statistically significant independent variables have the expected signs. The only exception is firm *size*. Target markets host lower share of trading for larger firms. The target market share of trading is reduced by only 2.5% if firm *size* increases by 10%. However, this is consistent with the findings of Baruch et al. (2007) and Halling et al. (2008). The estimated coefficient on *bkl* is positive indicating that the target market share of trading is larger if the target market contributes more to price discovery. A one standard deviation (2.29) increase in *bkl* results in a 31% (=exp(0.118*2.29)-1) increase in trading volume share of the target market. The negative coefficient on *volatility* agrees with the estimation results of Halling et al. (2008). A larger share of trading volume is hosted in the target market if the firm is sensitive to private information.

The geographical proximity plays only a marginally important role on the trading volume distribution of cross-listed securities as *geographic distance* is significant at 10% level. The estimated coefficient on *relative market turnover* is positive and significant indicating that the level of overall target market trading activity matters. A one standard deviation (2.13) increase in *relative market turnover* leads to a 104% (=exp(0.336*2.13)-1) increase in the target market share of trading. The *relative investor protection* is insignificant in model (2). Halling et al. (2008) shows that the fraction of US trading is larger for companies from countries with poor insider trading protection. My result indicates that this specific finding of Halling et al. is limited to the firms with a US cross-listing. Indeed, this is further validated by the comparison of estimation results on model (7) and (8). Model (7) reports the estimates using the sample of US cross-listings, and *relative investor protection* is statistically significant, which is consistent with the findings of Halling et al. (2008). However, this is not the case in model (8), which is the estimation result on the sample of cross-listings on non-US target markets.

Model (5) reports the result on the sample drawn from the firms with only 1 host market in a given year. For model (6), the sample is restricted to the firms with multiple cross-listings. In both model (5) and (6), *geographical distance* and *relative investor protection* are not statistically significant. For firms with multiple cross-listings, some explanatory variables that are designed to proxy firm's information environment are no longer significant factors in explaining multimarket trading dynamics. The measure of firm return *volatility* and the extent of *home market analyst* coverage have little influence on the trading volume distribution of cross-listed securities with multiple target markets. However, *bkl* is statistically significant in both model (5) and model (6). The estimated coefficient of *bkl* is positive, which confirms the importance of incremental pricing information generated from the target market in attracting trading volume. The estimated coefficient of *bkl* is larger for the firms with multiple cross-listings. From model (5), for the firms with only 1 cross-listing, a one standard deviation (2.19) increase in *bkl* results in a 22% (=exp(0.09*2.19)-1) increase in the target market share of trading. On the other hand, for the firms that cross-list on multiple target markets, model (6) reports that a one standard deviation (1.97) increase in *bkl* leads to a 42% (=exp(0.179*1.97)-1) increase in total volume share of the target market. When there are multiple target markets competing for order flows, the target market that provides better price relevant information hosts larger share of trading volume.

Model (7) is estimated using the sample US cross-listings and model (8) with cross-listings on non-US target markets. The estimation result of model (7) is mostly consistent with the findings of Baruch et al. (2007) and Halling et al. (2008). I note that only four explanatory variables are statistically significant in model (8). These include one market level (*relative market turnover*) and two firm level (*bkl* and firm *size*) factors. The trading volume distribution of cross-listed securities on non-US target markets is mainly driven by the level of overall target market trading activity and the target market's incremental contribution to price discovery. Furthermore, higher *institutional ownership* increases the US share of trading in model (7). The opposite is the case in model (8); for firms that cross-list on non-US target markets, higher *institutional ownership* reduces trading volume share of the target market. I examine the effects of global institutional investors on multimarket trading dynamics in the next section.

1.5.2 Results on familiarity bias and ambiguity aversion

First, I investigate whether institutional investor's relative proximity to home and target markets influence the trading volume distribution of cross-listed securities. I include eight proxies that measure geographical, cultural, economic, and market governance proximity: geographical distance (geographical proximity); language, colonial heritage, legal origin (cultural proximity); bilateral trade (economic proximity); exchange trading rules, investor protection, and accounting standards (market rules proximity). For each of eight familiarity proxies, I construct the *relative distance* measures using [2], [3], and [4] in Section 1.3. The *relative distance* measures are the key variables of interest. Intuitively, these *relative distance* variables measure how much "closer" institutional shareholders are to the target compared to the counterpart home market. If "proximity" preference guides global institutional investors in the selection of trading venues, then we should observe positive relation between *relative distance* and the target market share of trading volume.

Table 1.7 reports the familiarity bias regression estimation results. As shown in the correlation matrix (Table 1.11), *relative distance* measures are highly correlated with each other. Thus, each *relative distance* measure enters the regression separately in model (1) through model (8) in Table 1.7. I control for known factors that determine the trading volume distribution of cross-listed stocks. All regression specifications include year-fixed effects. All estimated coefficients on *relative distance* measures are positive and statistically significant at 1% level with the exception of *relative distance (investor protection)*, which is statistically significant at 5% level. This indicates that institutional investor familiarity bias influences the trading volume distribution of cross-listed stocks. The target market share of trading volume is higher for the firms that have institutional investor base “closer to” the target market. From model (1), I infer that geographical proximity matters to institutional investor in the selection of trading venues. A one standard deviation (13.96) increase in *relative distance (geo. distance)* leads to a 65% (=exp(0.036*13.96)-1) increase in the target market fraction of global trading volume. The estimation results of model (2), (3), and (4) indicate that institutional investor’s cultural proximity influence the location of stock trading. A one standard deviation (22.38) increase in *relative distance (language)* raises the target market share of trading by 50% (=exp(0.018*22.38)-1). Model (5) shows that economic proximity also plays an important role in multimarket trading dynamics. Lastly, the estimates of model (6), (7), and (8) confirm the importance of institutional investor’s proximity to market rules in attracting trading volume for the target market. A one standard deviation (15.16) increase in *relative distance (exchange rules)* results in a 53% (=exp(0.028*15.16)-1) increase in the target market share of trading volume.

Secondly, I examine whether institutional investors are averse to trading in markets with ambiguous (less detailed) market rules governing trading practices and thereby influencing the trading volume distribution of cross-listed securities. More specifically, I investigate whether institutional investors avoid trading in a market with ambiguous market rules even though these sophisticated institutional investors are familiar with them. I include three market rule measures: exchange trading rules, investor protection law, and accounting standards in regression analyses. Using each of three market rule measures, I lump target markets into two groups: the markets with detailed market rules and the markets with ambiguous rules. The target market dummy variables (*tm low (exchange rules)*, *tm low (investor protection)*, and *tm low (accounting standards)*) are as defined previously in Section 1.3. I include the interaction terms between the target dummy and the corresponding *relative distance* measure in the model specifications. The target market dummies and the interaction terms are the key variables. As investor participation would be limited if the target market is governed by ambiguous market rules, I expect to observe negative relations with the fraction of host market trading for both the target dummies and the interaction terms.

Table 1.8 tabulates the estimation results. Year-fixed effects are included in all regression specifications. I also control for known market- and firm-specific factors. I evaluate the above three cases separately in model (1), (2), and (3). Model (4), (5), and (6) include *relative distance (bilateral trade)* as an additional control. The estimated coefficients on all three target dummies are negative and statistically significant in model (1), (2), and (3) of Table 1.8, indicating that target markets with ambiguous market rules host less trading volume of cross-listed securities. From model (1), the target market share of trading volume is lower by 78% (=exp(-1.511)-1) if the host market features ambiguous exchange trading rules. Furthermore, the estimated coefficients on all three interaction terms are negative and statistically significant at 1% level. This implies that institutional investor's familiarity bias abates in the selection of trading venues if the target market has ambiguous market rules governing trading practices. As an example, in model (1), a one standard deviation (15.16) increase in *relative distance (exchange rules)* leads to a 120% (=exp(0.052*15.16)-1) increase in the target market share of trading volume. However, this increase in target market share of trading volume is reduced to only 11%

(=exp((0.052-0.045)*15.16)-1) when the target market features ambiguous exchange trading rules.

1.6 Event study: MiFID (the Directive on Markets in Financial Instruments)

In this section, I address potential endogeneity concerns in examining investor familiarity bias and ambiguity aversion. MiFID (the Directive on Markets in Financial Instruments) is an exogenous shock to exchange trading rules and investor protection regulations, which only affects UK and the countries in the European Union. The implementation of MiFID has two consequences; the harmonization and improvement (in the sense that regulations became more detailed and transparent) of exchange trading rules and investor protection provisions among the MiFID exchanges. For the cross-listed securities with both MiFID home exchange and MiFID target exchange, there is essentially no difference in trading rules and investor protection between the two markets after MiFID went into effect.

As much as the introduction of MiFID is a shock to exchange trading rules and investor protection regulations, it is also an exogenous shock to the investors in the MiFID countries. With the implementation of MiFID, for institutional traders domiciled in the MiFID countries, the market rules of the local trading venues has improved. In other words, the exchange rules and investor protection provisions, with which the institutional investors domiciled in the MiFID countries are familiar, became more detailed and transparent. Would these institutional investors from the MiFID countries become more averse to trading in other markets with ambiguous market rules as these institutional traders have become more accustomed to the better market rules of their local markets after MiFID? If investor familiarity bias and ambiguity aversion play important role in the selection of trading venues for the institutional traders from the MiFID countries, then I expect these institutional investors to avoid trading in markets with more ambiguous market rules after MiFID.

First, I examine the impact of regulatory harmonization or familiarization on multimarket trading dynamics.[13] To conduct difference-in-differences regression analyses, I define the following dummy variables. MiFID became effective in November 2007. The *year 2008~2011* dummy takes the value 1 for years, 2008, 2009, 2010, and 2011, and 0 otherwise. The *tm & hm MiFID* indicator variable takes the value 1 if both the target and the home market of the security are MiFID exchanges, and 0 otherwise. If the target market is a MiFID exchange and the home market is not, then the *tm MiFID & hm not* takes the value 1, and 0 otherwise. The *tm not & hm MiFID* takes the value 1 if the home market is a MiFID exchange and the target is not, and 0 otherwise. Lastly, the *tm not & hm not* takes the value 1 if both the target and the home market are non-MiFID exchanges, and 0 otherwise. Furthermore, I generate interaction terms between the target-home market combination indicator variables and *year 2008~2011* dummy.

Table 1.9 summarizes the impact of regulatory harmonization on the trading volume distribution of cross-listed securities. I draw the sample from 2004 to 2011 for all regression analyses in Table 1.9. All regression specifications include year-fixed effects. Models (2), (4), (6), and (8) include target market-fixed effects in addition to year-fixed effects. I control for known firm and market level factors in all regressions. Target markets on average gained trading volume share

[13] Cumming, Johan, and Li (2011) examines the impact of MiFID on overall market liquidity. They also identify legal factors that are associated with cross-sectional differences in liquidity. Furthermore, using a sample of cross-listed stocks on US markets, Cumming, Humphery-Jenner, and Wu (2011) tests whether exchange trading rules influence the US share of trading volume.

during the years between 2008 and 2011 as the coefficient of *year 2008~2011* dummy is positive and statistically significant. Model 1 examines the influence of harmonization of exchange trading rules among the MiFID exchanges. In model (1), the estimated coefficient of *tm & hm MiFID* is negative and statistically significant. On average, the MiFID targets have lower share of trading for firms with MiFID home markets. The estimated coefficient of *interaction term (tm & hm MiFID)* is positive, and it is statistically significant. The impact of exchange rule harmonization among the MiFID exchanges on the trading volume share of MiFID targets is estimated to be a gain of 227% (=exp(1.185)-1). The exchange rule harmonization between the target and its counterpart home market facilitates significantly more trading in the target markets.

Furthermore, I find some evidence that the improvement (become less ambiguous) in the market rules results in a larger share of trading volume for cross-listed securities from model (3), (4), (5), and (6). The estimation result is much stronger for the case where the home market is a MiFID exchange and the target is not. In model (5), the negative estimated coefficient on *interaction term (tm not & hm MiFID)* implies a smaller trading volume share for the target market when the integrity of market rules governing trading practices improves. The trading volume share decrease in a non-MiFID target market is approximately 53% (=exp(-0.748)-1).

Secondly, I investigate whether a shock to the local exchange trading rules induces a change in institutional investor trading behavior in other markets. Specifically, I examine whether the trading volume share of target markets with more ambiguous exchange trading rules is smaller for stocks that have higher MiFID institutional ownership after MiFID. The indicator variable *MiFID ownership* equals 1 if the stock has greater than the median MiFID institutional ownership of 3.6%, and 0 otherwise. The *tm low (non-MiFID tm)* is the same variable as the *tm low (exchange rules)* (defined in Section III) but labeled differently. Furthermore, I generate a three-way interaction variable among *tm low (non-MiFID tm)*, *MiFID ownership*, and *year 2008~2011*. I expect this 3-way interaction term to be negatively associated with the target market share of trading volume.

The estimation results are reported in Table 1.10. I only include securities with both non-MiFID home and target markets from 2004 to 2011 for all regression analyses in Table 10. Both model (1) and (2) include all known factors and year-fixed effects. I also include home market-fixed effects in model (2). The variable of interest is *interaction term (tm low & MiFID ownership & year 2008~2011)* in model (1). The estimated coefficient of this 3-way interaction term is negative and statistically significant. For stocks with higher MiFID institutional investor ownership, after MiFID was implemented, the non-MiFID target market share of trading volume decreased by additional 79% (=exp(-1.563)) if the target featured ambiguous exchange trading rules. This implies that institutional investors domiciled in the MiFID countries become more averse to trading in other markets with ambiguous trading rules as these institutional traders have become more accustomed to detailed trading rules of their local markets after MiFID.

1.7 Conclusion

One of major reasons for cross-listing on foreign stock exchanges is to provide more liquid trading environment for investors. The long-term viability of cross-listings critically depends on whether trading activity persists and where stock trading takes place. Consequently, understanding the trading volume distribution of cross-listed securities is important to firm managers who are seeking to cross-list, to stock exchanges, which compete with another for order flows, and to broker dealers who earn fees for facilitating trades. Lastly, it is also important to institutional investors who must decide on where to trade these cross-listed stocks.

The previous studies of Baruch et al. (2007) and Halling et al. (2008) draw a sample of firms that cross-list on US markets. We have little knowledge on the trading volume distribution of cross-listed securities on non-US target markets. There is a large variation in trading activities of cross-listed shares across target markets. US target markets mostly held on to their trading volume share of cross-listed stocks. The majority of European bourses never developed into vibrant target markets, including the London Stock Exchange.

Using a sample of 1,953 globally cross-listed securities on 19 target markets, I examine the factors that influence the trading volume distribution of cross-listed stocks. Only a small subset of known factors contributes in explaining multimarket trading dynamics of cross-listed securities on non-US target markets. This calls for further research. The main contribution of this paper is in the analyses that reveal the importance of investor familiarity bias and ambiguity aversion in explaining the trading volume distribution of cross-listed securities. The relative "proximity" of institutional shareholder base to the target and the home market exerts significant influence on multimarket trading dynamics of cross-listed securities. This result indicates that the investor familiarity bias plays an important role not only in portfolio holding and overseas financing decisions, but also in the selection of trading venues. Additionally, I document the importance of market rules governing trading practices in explaining the trading volume distribution of cross-listed shares. I find strong empirical evidence indicating that global institutional investors are averse to trading in markets that do not furnish detailed market rules (ambiguous rules) even if these institutional traders are “familiar” with ambiguous rules.

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Table 1.1:

This table reports the distribution of cross-border listings across 19 target ("host") exchanges grouped by home market region and home country's degree of economic development (developed vs. emerging). I use the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group. Each cell in the table represents the number of cross-listings. There are 2,932 cross-listed securities (secondary listings) during the period between January 2001 and December 2011.

Number of cross-listed securities

		home market region									
	target market	Developed Americas	Developed Asia	Developed Europe	Developed Middle East	Emerging Africa	Emerging Americas	Emerging Asia	Emerging Europe	Emerging Middle East	total
Asia	Australia	37	39	27	.	2	.	1	.	.	106
	Hong Kong	10	14	7	.	.	2	70	.	.	103
	Singapore	.	20	4	.	.	.	7	.	.	31
	Taiwan	.	25	1	.	1	.	.	.	.	27
	Tokyo	16	3	22	.	.	.	2	.	.	43
America	Lima	39	.	5	.	.	.	.	.	.	44
	NASDAQ	76	13	59	36	2	7	3	1	.	197
	New York	202	20	121	4	6	107	39	3	1	503
	Toronto	60	38	29	.	1	1	.	.	.	129
Europe & Africa	Euronext Amsterdam	44	.	65	.	.	.	1	.	.	110
	Euronext Brussels	10	.	41	1	2	.	.	.	.	54
	Euronext Lisbon	.	.	5	.	.	.	.	.	.	5
	Euronext Paris	40	2	110	.	6	1	.	.	.	159
	Frankfurt	86	12	103	1	3	4	3	22	2	236
	London	237	94	450	6	12	.	42	31	8	880
	Luxembourg	.	.	20	.	1	3	31	4	1	60
	Oslo	19	.	11	.	.	.	.	.	.	30
	Swiss	84	2	77	.	3	1	.	.	.	167
	Johannesburg	10	4	30	.	4	.	.	.	.	48
Total		970	286	1187	48	43	126	199	61	12	2932

Table 1.2:
This table describes cross-listing trend over the last decade. The sample includes cross-listed securities on 19 target ("host") markets grouped by region. The sample period spans from 2001 to 2011. Each cell represents the total number of cross-listed securities in a given year. The number of cross-listings decreased over the past decade, from 1,802 in 2001 to 1,221 in 2010.

Number of cross-listed securities

	target market	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Asia	Australia	50	47	42	49	48	52	52	48	50	52	52
	Hong Kong	33	37	40	41	42	49	62	69	75	91	95
	Singapore	19	19	18	18	18	19	22	20	19	21	19
	Taiwan	.	1	2	2	2	2	2	2	11	23	27
	Tokyo	38	38	34	32	30	27	24	20	12	12	9
America	Lima	19	23	26	25	25	24	28	27	26	27	27
	NASDAQ	141	139	136	134	133	122	124	124	115	107	102
	New York	351	359	375	394	395	387	377	357	357	349	343
	Toronto	32	29	28	27	32	39	49	58	56	66	70
Europe & Africa	Euronext Amsterdam	83	64	57	59	61	53	51	47	37	25	24
	Euronext Brussels	46	42	43	38	33	30	25	21	19	7	7
	Euronext Lisbon	1	2	2	3	3	4	5	5	5	5	3
	Euronext Paris	122	109	106	101	92	81	67	62	55	46	37
	Frankfurt	216	186	168	148	140	119	102	84	61	53	45
	London	462	608	612	617	612	638	654	357	251	214	201
	Luxembourg	42	39	35	33	32	34	31	25	23	22	23
	Oslo	12	13	11	9	10	14	14	12	12	12	10
	Swiss	122	118	112	105	125	123	124	121	49	48	37
	Johannesburg	13	14	14	15	17	22	27	34	41	41	40

Table 1.3:

Table 1.3 presents the distribution of multiple cross-listings across 19 target ("host") markets in selected years. Of 2,226 securities with cross-listings, three hundred seventy one (371) of these securities have cross-border listings on multiple target bourses. The cross-listing on multiple target markets has decreased over the last decade. There are a total of 1,033 cross-listings with no other secondary listing on any other target bourses in 2001, and a total of 368 cross-listings with exactly 1 other secondary listing on other host markets, 172 secondary listings with 2 other cross-listings, 89 cross-listings with 3 other cross-listings, and 140 secondary listings with 4 or more other cross-listings in 2001. There are about the same number of secondary listings, 958, with no other cross-listing on any other host markets in 2010 compared to in 2001. In contrast to this, by 2010, there are only 179 cross-listings with 1 other secondary listing on other host markets, only a total of 42 secondary listings with 2 other cross-listings, 32 cross-listings with 3 other secondary listings, and lastly, only 10 cross-listings with 4 or more other secondary listings.

Number of target markets

		no other target market			1 other target market			2 other target markets			3 other target markets			4 or more other target markets		
	target market	2001	2005	2010	2001	2005	2010	2001	2005	2010	2001	2005	2010	2001	2005	2010
Asia	Australia	36	35	44	9	7	7	3	3	.	1	1	1	1	2	.
	Hong Kong	21	27	73	8	11	14	3	1	3	1	2	1	.	1	.
	Singapore	18	18	20	.	.	.	.	.	1	.	.	.	1	.	.
	Taiwan	.	2	22	.	.	1	.	.	.	.	.	.	.	.	.
	Tokyo	5	3	4	11	11	4	6	5	2	4	2	1	12	9	1
America	Lima	3	3	17	5	5	4	3	4	1	2	6	3	6	7	2
	NASDAQ	126	123	103	10	8	3	3	2	1	1	.	.	1	.	.
	New York	242	298	289	68	59	49	23	21	6	8	8	4	10	9	1
	Toronto	28	29	57	1	1	8	.	.	1	1	1	.	2	1	.
Europe & Africa	Euronext Amsterdam	15	8	10	19	12	6	20	12	3	10	12	5	19	17	1
	Euronext Brussels	12	8	4	7	6	2	12	6	1	3	4	.	12	9	.
	Euronext Lisbon	.	2	4	.	.	.	.	.	.	.	1	1	1	.	.
	Euronext Paris	25	22	24	35	19	13	23	20	5	19	15	3	20	16	1
	Frankfurt	140	83	39	48	35	7	14	10	5	5	4	1	9	8	1
	London	290	421	164	101	118	35	34	34	7	19	20	6	18	19	2
	Luxembourg	20	18	15	12	9	6	5	2	.	.	.	1	5	3	.
	Oslo	11	10	12	1	.	.	.	.	.	.	.	.	.	.	.
	Swiss	31	32	25	31	34	11	22	21	6	15	17	5	23	21	1
	Johannesburg	10	13	32	2	4	9	1	.	.	.	.	.	.	.	.
	Total	1,033	1,155	958	368	339	179	172	141	42	89	93	32	140	122	10

Table 1.4:

This table summarizes the average *target market share of trading* across 19 target ("host") markets grouped by home market region and home country's degree of economic development (developed vs. emerging). I use the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group. For each cross-listed security of firm *i* traded on target market *j*, the *target market share of trading* is defined as the ratio of dollar amount traded on target market *j* (in US dollars) to the total dollar amount traded (in US dollars). The total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market for firm *i*. The *target market share of trading* is computed at weekly frequency, and these ratios are averaged over 1 year. The average values are calculated first by averaging over time for each cross-listing and then by computing the average within each target market.

Average *target market share of trading*

			home market region								
	target market	target market share of trading	Developed Americas	Developed Asia	Developed Europe	Developed Middle East	Emerging Africa	Emerging Americas	Emerging Asia	Emerging Europe	Emerging Middle East
Asia	Australia	0.22	0.23	0.19	0.29	.	0.00	.	0.00	.	.
	Hong Kong	0.30	0.10	0.27	0.13	.	.	0.00	0.36	.	.
	Singapore	0.21	.	0.23	0.17	.	.	.	0.17	.	.
	Taiwan	0.51	.	0.54	0.01	.	0.14	.	.	.	.
	Tokyo	0.00	0.00	0.00	0.01	.	.	.	0.01	.	.
America	Lima	0.10	0.10	.	0.12	.	.	.	.	.	.
	NASDAQ	0.48	0.55	0.38	0.28	0.63	0.58	0.58	0.52	0.77	.
	New York	0.36	0.42	0.13	0.14	0.22	0.51	0.54	0.25	0.75	0.27
	Toronto	0.15	0.11	0.16	0.22	.	0.26	0.00	.	.	.
Europe & Africa	Euronext Amsterdam	0.06	0.02	.	0.09	.	.	.	0.00	.	.
	Euronext Brussels	0.09	0.00	.	0.11	0.61	0.00	.	.	.	.
	Euronext Lisbon	0.19	.	.	0.19	.	.	.	.	.	.
	Euronext Paris	0.07	0.01	0.02	0.09	.	0.06	0.00	.	.	.
	Frankfurt	0.07	0.02	0.13	0.06	0.73	0.00	0.07	0.00	0.26	0.05
	London	0.09	0.05	0.17	0.07	0.31	0.04	.	0.01	0.44	0.32
	Luxembourg	0.01	.	.	0.02	.	0.03	0.01	0.00	0.00	0.00
	Oslo	0.29	0.31	.	0.27	.	.	.	.	.	.
	Swiss	0.01	0.01	0.00	0.02	.	0.00	0.01	.	.	.
	Johannesburg	0.28	0.09	0.17	0.35	.	0.31	.	.	.	.

Table 1.5: Panel A

This table reports the summary statistics. All mean values are calculated first by taking the time-series averages of the variables for each cross-listing and then by computing the average within each target ("host") market. Panel A of Table 1.5 presents the mean values of firm-specific variables for each target market. For each cross-listed security of firm *i* traded on target market *j*, the *target market share of trading* is defined as the ratio of dollar amount traded on target market *j* (in US dollars) to the total dollar amount traded (in US dollars). The total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market for firm *i*. The *target market share of trading* is computed at weekly frequency, and these ratios are averaged over 1 year. The *bkl* factor is estimated using equations [5], [6], and [7] in Section 1.3.5. Firm *size* is the firm's annual average market capitalization in billions of US dollars from Datastream. The percentage of *foreign sales* data is drawn annually from the Worldscope (item WC08731). The *relative industry capitalization* is the difference between the percentage of global industry market capitalization for the firm's industry in the target market and the percentage of global industry market capitalization for the firm's industry in the home market. The *relative industry capitalization* variable is constructed using the Level 3 Datastream industry indices data (10 industry groups). The *home market analyst* is the number of 1-year-ahead earnings-per-share (EPS) estimates for the home market security. Analyst EPS estimates are from the International Summary data of I/B/E/S, and the year-end values (December) are used. The *volatility* is the annual standard deviation of weekly home market security returns using data from Datastream.

				firm-specific factors					
	target market	num. of cross-listings	target market share of trading	bkl	size	foreign sales	rel. industry cap.	home mrkt. analyst	volatility
Asia	Australia	106	0.22	2.112	2.1	54.6	-6.5	6.0	0.072
	Hong Kong	103	0.30	1.883	25.8	23.4	-3.6	8.7	0.060
	Singapore	31	0.21	1.968	2.7	60.6	-1.6	7.4	0.082
	Taiwan	27	0.51	1.639	1.3	57.8	0.1	5.6	0.065
	Tokyo	43	0.00	1.315	58.6	43.1	-3.5	22.9	0.049
America	Lima	44	0.10	2.325	65.4	55.4	-20.7	18.0	0.071
	NASDAQ	197	0.48	2.222	2.7	56.4	48.6	7.3	0.079
	New York	503	0.36	2.187	13.6	41.3	27.8	11.0	0.067
	Toronto	129	0.15	2.488	4.0	47.3	-12.4	5.2	0.095
Europe & Africa	Euronext Amsterdam	110	0.06	1.983	35.1	48.5	-17.1	18.0	0.054
	Euronext Brussels	54	0.09	2.290	27.7	56.4	-6.9	18.6	0.053
	Euronext Lisbon	5	0.19	2.769	20.7	33.2	-1.3	19.5	0.050
	Euronext Paris	159	0.07	1.962	28.2	51.6	-7.5	16.2	0.053
	Frankfurt	236	0.07	1.541	7.3	39.5	-11.5	10.8	0.066
	London	880	0.09	1.538	14.9	44.6	-6.8	13.9	0.070
	Luxembourg	60	0.01	1.484	12.7	32.9	-2.8	13.2	0.062
	Oslo	30	0.29	2.960	0.8	40.3	-12.7	5.4	0.103
	Swiss	167	0.01	1.949	45.9	52.3	-18.5	21.4	0.049
	Johannesburg	48	0.28	3.109	4.9	76.4	-5.7	6.2	0.090
	Average	.	0.18	1.897	17.0	45.9	1.5	12.7	0.068

Table 1.5: Panel B

Panel B of Table 1.5 presents the mean values of market-specific variables for each target market. All mean values are calculated first by taking the time-series averages of the variables for each cross-listing and then by computing the average within each target (“host”) market. The *geographical distance* (in miles) is the distance between the target and the home market of the security. The *relative investor protection* is the difference between the investor protection index score of the target and that of the home market. The values of the investor protection index are drawn from La Porta, Lopez-de-Silanes, and Shleifer (2006). The *relative transaction cost* is constructed using the institutional investor transaction costs data from Elkins McSherry. I take the annual average of quarterly commission, fees, and market impact costs in basis points for each market in the sample. I then subtract the yearly average transaction costs of trading in the home market from that of at the target market to generate the estimates for the *relative transaction cost.* The *relative market turnover* is defined as the difference in the yearly average scaled (scaled by total market capitalization) turnover of the target and that of the home market of the cross-listed security. Data for *relative market turnover* comes from Datastream. The details of variable construction are provided in Section 1.3.6.

		market-specific factors			
	target market	geo. distance	rel. inv. protection	rel. transaction cost	rel. market turnover
Asia	Australia	6976	-1.11	-3.22	-0.04
	Hong Kong	2036	3.46	-6.73	-1.31
	Singapore	2713	0.70	-2.80	-0.38
	Taiwan	1346	-2.43	11.42	0.97
	Tokyo	5905	0.43	-12.60	-0.51
America	Lima	4014	-5.17	41.58	-2.57
	NASDAQ	3298	2.66	-12.56	2.28
	New York	3151	3.08	-13.93	2.39
	Toronto	3921	1.36	-1.96	-1.34
Europe & Africa	Euronext Amsterdam	2097	-1.68	-3.05	0.39
	Euronext Brussels	1151	-5.01	-1.88	-1.11
	Euronext Lisbon	463	-1.41	-2.63	-0.71
	Euronext Paris	2379	-1.89	-1.95	-0.21
	Frankfurt	2634	-6.73	-7.58	-2.06
	London	3002	1.90	13.48	0.66
	Luxembourg	3027	.	-7.57	-1.13
	Oslo	2517	-2.61	0.04	0.23
	Swiss	2618	-3.17	1.23	-0.79
	Johannesburg	5889	0.18	4.24	-0.46
	Average	3122	0.38	-0.01	0.36

Table 1.5: Panel C

Panel C of Table 1.5 presents the mean values of familiarity *relative distance* measures for each target market. All mean values are calculated first by taking the time-series averages of the variables for each cross-listing and then by computing the average within each target ("host") market. The familiarity proxies considered are: bilateral trade, geographical distance, common language, colonial heritage, common legal origin, exchange trading rules, investor protection, accounting standards. For each of eight familiarity proxies, the *relative distance* measures are constructed using [2], [3], and [4] in Section 1.3.2, and Section 1.3.3 provides the details of variable construction. Intuitively, these *relative distance* variables measure how much "closer" institutional shareholder base is to the target compared to its counterpart home market.

		familiarity (proximity) measures							
	target market	rel. dist. (bilateral trade)	rel. dist. (geo. distance)	rel. dist. (language)	rel. dist. (colony)	rel. dist. (legal origin)	rel. dist. (exchange rules)	rel. dist. (inv. protection)	rel. dist. (acct. standards)
Asia	Australia	-0.13	-15.02	0.00	-7.51	0.07	-5.94	-37.63	-36.35
	Hong Kong	.	-5.24	1.48	-4.64	1.35	-3.01	-1.38	5.86
	Singapore	-0.03	-1.80	0.39	-2.15	-0.64	-0.21	-3.72	-22.16
	Taiwan	0.17	-0.70	-4.01	-2.22	-4.15	-0.60	-9.47	-15.42
	Tokyo	0.17	-18.65	-27.47	-24.54	-25.82	-15.86	-64.98	-150.70
America	Lima	-0.32	-14.25	-36.97	-34.27	-35.88	-25.83	-192.48	-1270.09
	NASDAQ	1.89	4.10	5.70	10.57	1.08	3.52	30.34	67.08
	New York	2.48	2.93	6.02	6.43	5.47	2.82	34.35	96.21
	Toronto	-0.17	1.73	0.15	-15.28	-0.06	-4.17	-0.95	-45.70
Europe & Africa	Euronext Amsterdam	-0.05	-8.66	-28.18	-26.33	-26.24	-14.21	-124.05	-193.10
	Euronext Brussels	-0.08	-4.67	-15.48	-15.43	-18.88	-8.77	-201.08	-227.23
	Euronext Lisbon	0.02	-0.11	-2.85	-2.81	0.00	-0.22	-6.14	-260.66
	Euronext Paris	0.07	-4.99	-18.25	-16.63	-19.22	-8.46	-100.16	-25.24
	Frankfurt	0.34	-8.35	-25.35	-23.14	-26.83	-14.28	-264.61	-240.41
	London	0.12	-3.91	0.33	-13.95	-0.13	-4.63	-24.14	-119.03
	Luxembourg	-0.10	0.51	-0.56	-1.80	.	.	.	.
	Oslo	-0.16	-3.79	-13.44	-10.34	-12.41	-5.26	-50.60	-29.81
	Swiss	-0.38	-12.11	1.16	-33.06	-35.88	-12.38	-209.23	-98.07
	Johannesburg	-0.20	-5.31	0.26	-1.42	0.16	.	-4.18	7.77
	Average	0.66	-3.50	-3.29	-10.05	-6.32	-4.72	-47.91	-72.69

Table 1.6: Baseline regression results

Table 1.6 reports the baseline regression results. The annual panel includes 9,362 observations (security-target market-year) for 1,953 cross-listed securities ranging from 2001 to 2011.The regressions are estimated using pooled OLS method. The dependent variable in the regressions is the logistic transformation of weekly *target market share of trading* averaged over 1 year. The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. Model (1), (2), (3), and (4) are estimated using the entire sample. Models (1) through (4) only differ by the inclusion and exclusion of year and target market fixed-effects. Model (2) is the base case regression. Model (5) is the estimates on the sample of securities with 1 target market in a given year. The estimation result using only the sample of securities with cross-listings on more than 1 target market in a given year is labeled model (6). Model (7) reports the estimation result for US cross-listings, and model (8) shows the result for non-US cross-listings. The *institutional ownership* enters regressions as a control. For each firm, the *institutional ownership* is the percentage of the company's market capitalization (in US dollars) owned by institutions. The independent variable description is provided in Section 1.3.5 and 1.3.6. The standard errors are robust to clustering by firm and by year.

Baseline regression results

	All	All	All	All	1 target	>1 target	US target	non-US target
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
bkl	0.159***	0.118***	0.090***	0.063***	0.090**	0.179***	0.034***	0.146***
	[0.032]	[0.032]	[0.021]	[0.020]	[0.042]	[0.036]	[0.010]	[0.038]
rel. industry cap.	0.044***	0.044***	0.021***	0.018***	0.048***	0.045***	0.004	0
	[0.005]	[0.005]	[0.005]	[0.005]	[0.006]	[0.005]	[0.003]	[0.006]
size	-0.243***	-0.323***	-0.224***	-0.301***	-0.262***	-0.180**	-0.087***	-0.442***
	[0.071]	[0.070]	[0.057]	[0.056]	[0.090]	[0.090]	[0.033]	[0.097]
home mrkt. analyst	-0.062***	-0.041**	-0.036***	-0.018	-0.076***	-0.022	-0.004	-0.029
	[0.018]	[0.017]	[0.013]	[0.013]	[0.014]	[0.022]	[0.007]	[0.027]
volatility	10.043***	7.623**	7.169***	5.937**	7.365**	7.365	6.150***	4.502
	[3.138]	[3.454]	[2.519]	[2.411]	[3.473]	[4.828]	[1.511]	[4.148]
geo. distance	-0.127*	-0.130*	-0.317***	-0.330***	-0.138*	-0.014	-0.217***	-0.121
	[0.066]	[0.068]	[0.053]	[0.054]	[0.079]	[0.098]	[0.070]	[0.076]
rel. market turnover	0.336***	0.317***	0.378***	0.293**	0.247***	0.477***	0.554***	0.192
	[0.077]	[0.067]	[0.133]	[0.123]	[0.063]	[0.110]	[0.089]	[0.130]
rel. transaction cost	-0.059***	-0.057***	-0.039***	-0.038***	-0.065***	-0.044***	-0.019***	-0.061***
	[0.008]	[0.008]	[0.005]	[0.005]	[0.009]	[0.008]	[0.004]	[0.010]
rel. inv. protection	0.066	0.055	0.039	0.038	-0.006	0.074	0.055**	0.011
	[0.044]	[0.043]	[0.034]	[0.032]	[0.042]	[0.058]	[0.025]	[0.059]
institutional ownership	0.002	0.001	-0.009***	-0.011***	0.005	0	0.019***	-0.031***
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.005]	[0.003]	[0.004]
Constant	-4.568***	-4.838***	-1.744***	-2.432***	-4.401***	-6.547***	-3.081***	-4.843***
	[0.795]	[0.752]	[0.614]	[0.577]	[0.783]	[1.064]	[0.578]	[0.721]
Year fixed-effect	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Target fixed-effect	No	No	Yes	Yes	No	No	No	No
Observations	9362	9362	9362	9362	5471	3891	3176	6186
R-squared	0.58	0.6	0.68	0.7	0.62	0.5	0.47	0.47

Standard errors robust to clusterings by firm and by year.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.7: Familiarity bias regression results

Table 1.7 reports the regression estimations for the familiarity bias hypothesis. The regressions are estimated using pooled OLS method. The dependent variable in the regressions is the logistic transformation of weekly *target market share of trading* averaged over 1 year. The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. Models (1) through (8) include eight proxies that measure geographical, cultural, economic, and market governance proximity: geographical distance (geographical proximity); language, colonial heritage, legal origin (cultural proximity); bilateral trade (economic proximity); exchange trading rules, investor protection, and accounting standards (market rules proximity), respectively. For each of eight proximity proxies, the *relative distance* measures are constructed using [2], [3], and [4] in Section 1.3.2, and Section 13.3 provides the details of variable construction. The *relative distance* measures are the key variables of interest. Intuitively, these *relative distance* variables measure how much "closer" institutional shareholder base is to the target compared to its counterpart home market. The standard errors are robust to clustering by firm and by year.

Familiarity bias regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
bkl	0.120***	0.112***	0.111***	0.116***	0.122***	0.089***	0.115***	0.112***
	[0.031]	[0.031]	[0.030]	[0.032]	[0.033]	[0.030]	[0.033]	[0.031]
rel. industry cap.	0.039***	0.044***	0.033***	0.043***	0.039***	0.040***	0.044***	0.042***
	[0.005]	[0.005]	[0.004]	[0.005]	[0.004]	[0.005]	[0.004]	[0.004]
size	-0.339***	-0.313***	-0.298***	-0.309***	-0.404***	-0.303***	-0.317***	-0.309***
	[0.062]	[0.069]	[0.069]	[0.070]	[0.058]	[0.071]	[0.073]	[0.069]
home mrkt. analyst	-0.034**	-0.040**	-0.041**	-0.040**	-0.024	-0.039**	-0.039**	-0.041**
	[0.016]	[0.018]	[0.017]	[0.017]	[0.015]	[0.018]	[0.017]	[0.017]
volatility	7.026**	7.327**	6.303*	7.134**	7.481**	7.569**	7.167**	7.311**
	[3.345]	[3.363]	[3.242]	[3.375]	[3.287]	[3.629]	[3.417]	[3.326]
geo. distance		-0.137**	-0.089	-0.122*	0.083	-0.12	-0.117*	-0.123*
		[0.068]	[0.074]	[0.067]	[0.062]	[0.074]	[0.068]	[0.072]
rel. market turnover	0.286***	0.291***	0.286***	0.299***	0.353***	0.338***	0.319***	0.290***
	[0.069]	[0.063]	[0.068]	[0.067]	[0.068]	[0.070]	[0.055]	[0.063]
rel. transaction cost	-0.055***	-0.058***	-0.054***	-0.058***	-0.056***	-0.056***	-0.057***	-0.050***
	[0.008]	[0.008]	[0.008]	[0.008]	[0.009]	[0.008]	[0.009]	[0.007]
rel. inv. protection	0.024	0.006	-0.001	0.009	0.043	-0.002		0.009
	[0.045]	[0.047]	[0.045]	[0.042]	[0.031]	[0.050]		[0.045]
rel. dist. (geo. distance)	0.036***							
	[0.009]							
rel. dist. (language)		0.018***						
		[0.004]						
rel. dist. (colony)			0.026***					
			[0.003]					
rel. dist. (legal origin)				0.013***				
				[0.004]				
rel. dist. (bi-trade)					0.154***			
					[0.020]			
rel. dist. (exchange rules)						0.028***		
						[0.007]		
rel. dist. (inv. protection)							0.001**	
							[0.001]	
rel. dist. (acct. stds.)								0.002***
								[0.000]
Constant	-5.617***	-4.627***	-4.660***	-4.741***	-6.735***	-4.669***	-4.808***	-4.685***
	[0.357]	[0.713]	[0.773]	[0.728]	[0.581]	[0.787]	[0.738]	[0.760]
Year fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9362	9362	9362	9362	8651	9081	9362	9362
R-squared	0.61	0.61	0.62	0.61	0.62	0.61	0.6	0.61

Standard errors robust to clusterings by firm and by year.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.8: Ambiguity aversion

Table 1.8 reports the regression estimations for the ambiguity aversion hypothesis. The regressions are estimated using pooled OLS method. The dependent variable in the regressions is the logistic transformation of weekly *target market share of trading* averaged over 1 year. The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. Models (1) through (3) include three market rule measures: exchange trading rules, investor protection law, and accounting standards, respectively. Using each of three market rule measures, target markets are lumped into two groups: the markets with detailed market rules and the markets with ambiguous rules. The target market dummy variables (*tm low (exchange rules)*, *tm low (investor protection)*, and *tm low (accounting standards)*) are as defined in Section 1.3.4. The variable description of *relative distance* measures is in Section 1.3.2 and Section 1.3.3. The *interaction term (exchange rules)* is the interaction term between *tm low (exchange rules)* and *relative distance (exchange rules)*. The *interaction term (investor protection)* is the interaction term between *tm low (investor protection)* and *relative distance (investor protection)*. The *interaction term (accounting standards)* is the interaction term between *tm low (accounting standards)* and *relative distance (accounting standards)*. The target market dummies and the interaction terms are the key variables. Model (4), (5), and (6) include *relative distance (bilateral trade)* as an additional control. All regressions include known market- and firm-specific factors from model (2) in Table 1.6, but the coefficient estimates for known factors are not shown in Table 1.8 to conserve space. The standard errors are robust to clustering by firm and by year.

Ambiguity aversion regression results

	(1)	(2)	(3)	(4)	(5)	(6)
rel. dist. (bi-trade)				0.187***	0.166***	0.142***
				[0.020]	[0.020]	[0.019]
rel. dist. (exchange rules)	0.052***			0.077***		
	[0.011]			[0.009]		
tm low (exchange rules)	-1.511***			-1.451***		
	[0.387]			[0.364]		
interact term. (exchange rules)	-0.045***			-0.054***		
	[0.010]			[0.009]		
rel. dist. (inv. protection)		0.008***			0.009***	
		[0.001]			[0.001]	
tm low (inv. protection)		-0.930**			-0.421	
		[0.391]			[0.384]	
interact. term (inv. protection)		-0.009***			-0.009***	
		[0.001]			[0.001]	
rel. dist. (acct. stds.)			0.005***			0.006***
			[0.001]			[0.001]
tm low (acct. stds.)			-1.326***			-1.925***
			[0.317]			[0.441]
interact. term (acct. stds.)			-0.004***			-0.005***
			[0.001]			[0.001]
Constant	-4.161***	-4.137***	-3.442***	-6.442***	-6.565***	-5.125***
	[0.650]	[0.921]	[0.742]	[0.521]	[0.752]	[0.746]
Year fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9081	9362	9362	8374	8651	8651
R-squared	0.62	0.62	0.63	0.65	0.63	0.65

Standard errors robust to clusterings by firm and by year.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.9: MiFID event study

This table reports the regression results for MiFID (the Directive on Markets in Financial Instruments) event study. Only the observations between 2004 and 2011 are used for all regression in Table 1.9. The regressions are estimated using pooled OLS method. Model (1), (3), (5), and (7) include year-fixed effects. Model (2), (4), (6), and (8) include both year- and target market-fixed effects. The dependent variable in the regressions is the logistic transformation of weekly *target market share of trading* averaged over 1 year. The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. The *year 2008~2011* dummy takes the value 1 for years, 2008, 2009, 2010, and 2011, and 0 otherwise: the *year 2008~2011* dummy takes the value 1 for the period after the implementation of MiFID. The *tm & hm MiFID* indicator variable takes the value 1 if both the target and the home market of the security are MiFID exchanges, and 0 otherwise. If the target market is a MiFID exchange and the home market is not, then the *tm MiFID & hm not* takes the value 1, and 0 otherwise. The *tm not & hm MiFID* takes the value 1 if the home market is a MiFID exchange and the target is not, and 0 otherwise. The *tm not & hm not* takes the value 1 if both the target and the home market are non-MiFID exchanges, and 0 otherwise. The *interaction term (tm & hm MiFID)* is the interaction term between *tm & hm MiFID* and *year 2008~2011* dummy. The rest of the interaction terms are defined similarly. All regressions include known market- and firm-specific factors from model (2) in Table 1.6, but the coefficient estimates for known factors are not shown in Table 1.9 to conserve space. The standard errors are robust to clustering by firm and by year.

MiFID event study 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
tm & hm MiFID	-3.652***	-3.380***						
	[0.200]	[0.436]						
interact. term (tm & hm MiFID)	1.185***	1.527***						
	[0.238]	[0.268]						
tm MiFID & hm not			-0.652**	2.571***				
			[0.298]	[0.635]				
interact. term (tm MiFID & hm not)			0.14	0.969**				
			[0.319]	[0.409]				
tm not & hm MiFID					1.170***	0.281		
					[0.319]	[0.336]		
interact. term (tm not & hm MiFID)					-0.748***	-0.792***		
					[0.214]	[0.192]		
tm not & hm not							2.323***	0.969***
							[0.226]	[0.325]
interact. term (tm not & hm not)							-1.494***	-1.702***
							[0.217]	[0.159]
Constant	0.562	0.313	-5.475***	0.299	-4.691***	-3.257***	-5.947***	-3.354***
	[0.577]	[0.766]	[0.857]	[0.832]	[0.883]	[0.560]	[0.672]	[0.667]
Year fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Target fixed-effect	No	Yes	No	Yes	No	Yes	No	Yes
Observations	7933	7933	7933	7933	7933	7933	7933	7933
R-squared	0.65	0.7	0.6	0.69	0.6	0.68	0.63	0.68

Standard errors robust to clusterings by firm and by year.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.10: MiFID event study continued

This table reports the regression results for MiFID (the Directive on Markets in Financial Instruments) event study. A sample of securities with both non-MiFID home and target markets from 2004 to 2011 is used for all regression analyses in Table 1.10. The regressions are estimated using pooled OLS method. Model (1) includes year-fixed effects. Model (2) includes both year- and home market-fixed effects. The dependent variable in the regressions is the logistic transformation of weekly *target market share of trading* averaged over 1 year. The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. The *year 2008~2011* dummy takes the value 1 for years, 2008, 2009, 2010, and 2011, and 0 otherwise: the *year 2008~2011* dummy takes the value 1 for the period after the implementation of MiFID. The dummy variable, *tm low (non-MiFID tm)*, is defined exactly the same as *tm low (exchange rules)* in Section III. The indicator variable *MiFID ownership* equals 1 if the stock has greater than the median MiFID institutional ownership of 3.6%, and 0 otherwise. The three-way interaction term among *tm low (non-MiFID tm)*, *MiFID ownership*, and *year 2008~2011* is denoted as *interaction term (tm low & MiFID ownership & year 2008~2011)*. The interaction term *interaction term (tm low & MiFID ownership & year 2008~2011)* is the key variable of interest. All regressions include known market- and firm-specific factors from model (2) in Table 1.6, but the coefficient estimates for known factors are not shown in Table 1.10 to conserve space. The standard errors are robust to clustering by firm and by year.

MiFID event study 2

	(1)	(2)
	[0.037]	[0.208]
year 2008~2011	-0.922***	-0.168
	[0.292]	[0.289]
MiFID ownership	-0.059	-0.024
	[0.132]	[0.124]
tm low (non-MiFID tm)	-3.195***	-2.830***
	[0.674]	[1.082]
interact. term (tm low & year 2008~2011)	4.793***	2.887**
	[0.797]	[1.190]
interact. term (MiFID ownership & year 2008~2011)	0.572***	0.484***
	[0.187]	[0.163]
interact. term (tm low & MiFID ownership)	-0.25	0.96
	[0.664]	[1.135]
interact. term (tm low & MiFID ownership & year 2008~2011)	-1.563**	-2.114*
	[0.758]	[1.143]
Constant	0.891	0.715
	[0.544]	[1.916]
Year fixed-effect	Yes	Yes
Home fixed-effect	No	Yes
Observations	2820	2820
R-squared	0.66	0.72

Standard errors robust to clusterings by firm and by year.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 1.11:
This table tabulates correlation coefficient of all variables.

	target market share of trading	bkl	size	foreign sales	rel. industry cap.	home mrkt. analyst	volatility	geo. distance	rel. inv. protectiom	rel. transaction cost	rel. market turnover
target share of trading	1										
bkl	0.17	1									
size	-0.16	-0.03	1								
foreign sales	0.06	0.06	0.05	1							
relative industry cap.	0.45	0.11	-0.23	0.10	1						
home mrkt analyst	-0.30	-0.01	0.36	0.17	-0.12	1					
volatility	0.22	0.04	-0.19	0.02	0.09	-0.20	1				
geo. distance	-0.04	-0.04	0.03	-0.15	-0.06	-0.16	0.02	1			
rel. inv. protectiom	0.29	0.03	-0.19	0.03	0.61	0.05	0.04	-0.09	1		
rel. transaction cost	-0.42	-0.07	0.10	-0.07	-0.48	0.22	-0.15	0.00	-0.12	1	
rel. market turnover	0.50	0.06	-0.23	0.01	0.63	-0.11	0.10	-0.04	0.72	-0.34	1
rel. dist. (bilateral trade)	0.21	0.04	-0.11	0.01	0.29	-0.12	0.01	-0.26	0.03	-0.11	0.26
rel. dist. (geo. distance)	0.34	0.07	-0.18	0.05	0.63	-0.09	0.10	-0.15	0.64	-0.26	0.61
rel. dist. (language)	0.30	0.07	-0.16	0.00	0.39	-0.05	0.08	-0.01	0.59	-0.10	0.51
rel. dist. (colony)	0.40	0.08	-0.19	0.08	0.71	-0.08	0.13	-0.05	0.68	-0.33	0.64
rel. dist. (legal origin)	0.29	0.05	-0.20	0.00	0.47	-0.06	0.10	-0.07	0.72	-0.07	0.60
rel. dist. (exchange rules)	0.37	0.07	-0.20	0.07	0.64	-0.08	0.13	-0.10	0.70	-0.27	0.62
rel. dist. (inv. protection)	0.35	0.06	-0.17	0.04	0.56	-0.06	0.10	-0.10	0.77	-0.16	0.64
rel. dist. (acct. standards)	0.34	0.07	-0.19	0.01	0.55	-0.10	0.10	-0.01	0.54	-0.43	0.57

Table 1.11: continued
This table tabulates correlation coefficient of all variables.

	rel. dist. (bilateral trade)	rel. dist. (geo. distance)	rel. dist. (language)	rel. dist. (colony)	rel. dist. (legal origin)	rel. dist. (exchange rules)	rel. dist. (inv. protection)	rel. dist. (acct. standards)
rel. dist. (bilateral trade)	1							
rel. dist. (geo. distance)	0.13	1						
rel. dist. (language)	0.06	0.57	1					
rel. dist. (colony)	0.01	0.88	0.58	1				
rel. dist. (legal origin)	0.12	0.67	0.79	0.70	1			
rel. dist. (exchange rules)	0.03	0.89	0.74	0.93	0.78	1		
rel. dist. (inv. protection)	0.12	0.75	0.75	0.79	0.92	0.86	1	
rel. dist. (acct. standards)	0.07	0.66	0.62	0.72	0.55	0.77	0.63	1

CHAPTER 2

WHERE IS THE MARKET?:

AFTERMATH OF *MORRISON vs. NATIONAL AUSTRALIA BANK LTD.*

2.1 Introduction

On June 24, 2010, the United States Supreme Court issued a ruling that is of great consequence to global investors. The *Morrison vs. National Australia Bank Ltd.* (Morrison hereafter) involved a large Australian bank with common shares trading in Australia and in several other countries and ADR trading in the US market. The fraud took place in a wholly-owned Florida subsidiary. The United States District Court of Appeals dismissed the fraud claim by a class made up solely of foreign investors who purchased common stocks in Australia. But, more importantly, the Supreme Court of the United States ruled that civil liability for securities fraud applies (Section 10(b) of the Securities Exchange Act of 1934, Rule 10b-5) only to securities listed in the US markets and to securities transactions taken place in the US; the oral argument before the Supreme Court occurred on March 29, 2010, and the Supreme Court's decision was announced to the public on June 24, 2010.[14] The Supreme Court's decision on the *Morrison* clearly communicates that the protection of the US securities laws does not cover the transactions of stocks that are listed in non-US exchanges. As a result of this decision, non-US firms with cross-listings on US markets were suddenly shielded from civil liability claims by the US investors who purchased their shares in the counterpart home markets. Furthermore, investors who purchased shares of US companies in non-US markets can no longer be protected by fraud-

[14] See Robert Morrison et al., Petitioners, v. National Australia Bank Ltd., *et al.*, the Supreme Court of the United States, No. 08-1191, decided June 24, 2010. Associate Justice Antonin Scalia delivered the opinion of the Court.

related provisions of US securities laws. Such a massive abrupt change in the securities fraud law is nearly unprecedented.

Many firms around the world choose to cross-list their shares globally. Managers at corporations, investors, and academics have studied and weighed various sources of cross-listing benefits [Karolyi (2006); Gagnon and Karolyi (2012)]. According to Mittoo (1992), Fanto and Karmel (1997), and Bancel and Mittoo (2001), both investors and corporate managers often quoted enhanced trading environment as one of the primary motivations and benefits for listing shares on overseas markets. Empirical evidence suggests that there is dramatic increase in trading volume and turnover rates both at the home and at the US market around the US listing of foreign shares [Smith and Sofianos (1997); Foerster and Karolyi (1998); Halling, Pagano, Randl, and Zechner (2008)]. An important issue is whether trading activity of cross-listed shares on the overseas markets persists after the cross-listing and what determines where stock trading is likely to take place between the home market and the new "host" (or target) market. These issues are relevant to all corporate managers who already listed their shares and are looking to cross-list on foreign markets, to stock exchanges, which compete with one another for order flow among existing listings and for new listings, and to broker dealers who have commercial interests in facilitating trades of existing and newly listed shares.

The Morrison ruling has important implications to multimarket trading dynamics and liquidity of cross-listed securities and global market participants. The key question is whether or not investors would purchase foreign securities more through foreign direct listing and the ADR markets in the US for the protection of the US security laws. Would investors eliminate or reduce their holdings of securities listed in the home market (outside of the US) and re-purchase substitute securities in the ADR markets for the US legal protection? As a result of investor reactions to the Morrison decision, would location of stock trading for US cross-listed firms influenced?

In this paper, we examine whether and how the trading volume distribution of US cross-listed securities has changed around the Morrison ruling. Additionally, we investigate whether multimarket trading dynamics of cross-listed securities (on non-US "host" markets) of US firms have materially changed around the Morrison decision. Lastly, for US cross-listings, we study whether the US share of trading volume were differentially affected depending on the degree of investor protection in the firm's country of domicile (home country) as a result of the US Supreme Court's decision on the Morrison case.

Using a sample of 641 securities cross-listed on US and non-US target markets, we document that for US cross-listed foreign firms, the US market share of trading volume has increased by 28% after the Morrison decision. Furthermore, among the US cross-listed firms, the US share of trading volume is higher by additional 12% for firms with the home markets that feature poor investor protection laws after the Morrison ruling. However, unlike cross-listed securities on US markets, the multimarket trading dynamics of cross-listed stocks on non-US target markets for US firms are largely unaffected by the Morrison ruling.

To the best of our knowledge, our study is the first to examine whether and how the trading volume distribution and liquidity of US cross-listed shares are impacted by the Morrison ruling.

There are other papers that investigate the impact of the Morrison decision. One paper that studies the ramifications of the Morrison is Licht, Li, and Siegel (2011). Licht, Li, and Siegel (2011) test the legal boding hypothesis by analyzing markets' reactions to a sudden change in the law governing US-listed foreign firms. They examine abnormal returns of foreign cross-listed stocks around two distinct announcements by the Supreme Court of the United States regarding the Morrison. They find that US-listed foreign shares in both home and US markets experience positive abnormal returns around the announcements related to the Morrison; these abnormal returns are higher the greater the percentage of firm's capital listed on non-US exchanges but are unrelated to the corporate governance and legal environment in foreign issuers' home country. They interpret their results to be a challenge to the legal bonding hypothesis, and they conclude that the US civil liability regime as currently designed may not have been viewed as a source of economic value for outside investors.

On the other hand, Gagnon and Karolyi (2012) shows that the price deviations between the cross-listed and underlying home-market shares widened more dramatically for those companies with a lower presence in the U.S. as measured by the fraction of global trading that takes place in U.S. markets. Consequently, Gagnon and Karolyi (2012) concludes that the market's revaluation of the cross-listed shares around the decision is consistent with the idea of legal bonding hypothesis.

The remainder of this paper is organized as follows. Section 2.2 discusses sampling process and describes the sample. Section 2.3 discusses variable construction. Section 2.4 reports the summary statistics. Section 2.5 reports the empirical results. Section 2.6 concludes.

2.2 Sample construction & description

In this section, we discuss our sample construction process and describe our sample. Our goal is to analyze the effects of the Morrison decision on the multimarket trading dynamics of US cross-listed securities. We draw our US sample from cross-listings on the New York Stock Exchange and the NASDAQ. The New York Stock Exchange sample includes listings on AMEX. We ignore cross-listed securities traded on US OTC markets. Furthermore, the World Federation of Exchanges provides statistics on the number of foreign listings for stock exchanges around the world. In selecting non-US target (or "host") markets, we pick out stock exchanges that list larger number of foreign securities for each of the four regions, Africa, Americas, Asia, and Europe. This process results in 17 target stock exchanges from 2009 to 2011. These 17 target markets include Johannesburg (Africa), Australia, Hong Kong, Singapore, Taiwan, Tokyo (Asia), Lima, Toronto (Americas), Euronext Amsterdam, Euronext Brussels, Euronext Lisbon, Euronext Paris, Frankfurt, London, Luxembourg, Oslo, and Swiss (Europe). We only consider exchange listed securities. The London Stock Exchange listings include foreign listings on Alternative Investment Market (AIM) but not SEAQ International as securities traded on SEAQ are not exchange listed securities. The Singapore Stock Exchange data includes listings on SESDAQ. The listings on the TSX Venture are a part of the Toronto market sample. Our Euronext samples include listings on Alternext markets. For the Frankfurt sample, we only consider foreign securities listed under prime standard, general standard, and entry standard. We ignore all foreign listings on OTC markets.

We use Datastream stock universe to construct the sample of cross-listed securities. We exclude all securities of special types, such as preferred shares, royalty trusts, and investment funds. We also drop all company stocks domiciled in tax havens. We then identify foreign securities based on the country of incorporation. To seek out cross-listings, we manually match securities listed on target markets with the home market securities using company name, security name, and ISIN codes. The cross-listed securities sample is further restricted by the availability of weekly price and trading volume data from Datastream. We limit our sample period to be between July 1, 2009 and March 31, 2011 (three quarters before and after the Morrison decision). Lastly, we exclude all cross-listed securities that are newly listed during the period between July 1, 2008 and March 31, 2011 as Halling et al. (2008) documents that the target market share of trading volume is much higher during the cross-listing year than the subsequent period. We also drop all delisted cross-listings during our sample period. After applying our exclusion criteria, our US sample (treated group) consists of 426 cross-listings. For our sample of cross-listed stocks on non-US target markets (control group), we are left with the final sample of 513 cross-listings on 17 non-US target markets.

Table 2.1 shows the distribution of cross-border listings across 19 target exchanges (2 US and 17 non-US target markets) grouped by home region and home country's degree of economic development (developed vs. emerging). We use the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group. The New Stock Exchange hosts 329 cross-listed securities, and the NASDAQ lists 97 cross-listings. Among 17 non-US target markets, the London Stock Exchange hosts the largest number of cross-listings, 163. The Euronext Lisbon and the Taiwan stock Exchange are the smallest host market with only

2 cross-listings, respectively. Most target markets draw a larger number of cross-listings from countries geographically close. This is consistent with the findings of Sarkissian and Schill (2004). Sarkissian and Schill (2004) finds that geographical proximity plays an important role in the choice of overseas listing venues. Furthermore, approximately 74% (695 out of 939) of cross-listings come from companies domiciled in developed countries. We note that firms domiciled in developed Americas are over-represented in our US sample compared to the non-US sample (38% versus 28%). Firms from developed Europe are under-represented in the US sample (23% versus 35%). The majority of cross-border listings from the developing world originates from companies domiciled in emerging Americas and emerging Asia. Companies from emerging Americas mainly cross-list their shares on the New York Stock Exchange. Firms domiciled in emerging Americas are over-represented in our US sample compared to the sample cross-listings on non-US target markets (17% versus 0.4%). Table 2.2 presents the distribution of cross-listed securities across 19 target exchanges (2 US and 17 non-US target markets) grouped by 10 industries. We use the Level 3 Datastream industry classification (10 industry groups).

2.3 Variable construction

In this section, we describe the construction of dependent variable, *target market share of trading*. Known firm (*bkl* information factor, *size, relative industry capitalization, home market analyst, volatility*) and market level control variables (*geographical distance, relative investor protection, relative transaction cost, relative market turnover*) are based on the theories of Pagano (1989), Chowdhry and Nanda (1991), Admati and Pfleifer (1988), and Baruch et al. (2007). We also include several known firm and market level explanatory variables from an empirical paper on multimarket trading, Halling et al. (2008).

2.3.1 *target market share of trading*

The purpose of this paper is to examine whether and how the trading volume distribution of cross-listed securities is influenced by an abrupt change in the US investor protection laws. We measure the intensity of trading activity in terms of the dollar value of transaction amount (the number of shares traded times the closing price).[15] For each cross-listed security of firm *i* traded on target market *j*, we define *target market share of trading* as the ratio of dollar amount traded on target market *j* (in US dollars) to the total dollar amount traded (in US dollars). The total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market for firm *i*.

$$target\ market\ share\ of\ trading_{ij} = \frac{volume^{tm_j} \times price^{tm_j}}{\sum_l [volume^{tm_l} \times price^{tm_l}] + volume^{hm} \times price^{hm}} \quad [1]$$

where tm_j denotes target market *j*, and *hm* indicates home market. Using data from Datastream, we compute the *target market share of trading* at weekly frequency, and these ratios are averaged over each quarter during the sample period. We then take the natural log of these annually averaged ratios. Our measure of trading volume share improves upon those of Baruch et al. (2007) and Halling et al. (2008). Both Baruch et al. (2007) and Halling et al. (2008) only include the trading volume of US markets and that of home market. They ignore trading activities in other target markets (non-US host markets).

[15] This definition resolves any complications arising from ADR and GDR bundling ratios in measuring trading volume as the price of ADR and GDR account for bundling ratios.

2.3.2 Known firm-specific factors

bkl factor

Baruch et al. (2007) develops a multimarket trading model (the BKL model hereafter) to explain cross-sectional variations in the foreign share of trading activity of cross-listed stocks. Empirically, the *bkl* information factor represents the incremental contribution of target market returns in explaining the firm's stock returns over and above the portion captured by the firm's home market returns. I adjust *bkl* factor estimation to account for the cases where a firm's stock is cross-listed on multiple target markets. For securities with cross-border listings on multiple host markets, the *bkl* factor measures the incremental contribution of host market returns in explaining the firm's stock return variations in addition to the firm's stock return information contained in the firm's home and other host market returns. To compute *bkl* measures, for each cross-listed security of firm *i* traded on target market *j*, I estimate the following two time-series regressions:

[Restricted model (R)]:

$$R_{it} = \alpha_i + \sum_{k=-1}^{+1} \beta_{i,hm,t+k} R_{hm,t+k} + \sum_{\sim j} \sum_{k=-1}^{+1} \beta_{i,tm_{\sim j},t+k} R_{tm_{\sim j},t+k} + \varepsilon_{it} \qquad [2]$$

and

[Unrestricted model (UR)]:

$$R_{it} = \alpha_i + \sum_{k=-1}^{+1} \beta_{i,hm,t+k} R_{hm,t+k} + \sum_{\sim j} \sum_{k=-1}^{+1} \beta_{i,tm_{\sim j},t+k} R_{tm_{\sim j},t+k} + \sum_{k=-1}^{+1} \beta_{i,tm_j,t+k} R_{tm_j,t+k} + \varepsilon_{it} \qquad [3]$$

where R_{it} is the total return (measured in US dollars) of firm *i* in period *t*, $R_{hm,t+k}$ is the total return (measured in US dollars) on the market index in the firm *i*'s home country in period *t+k*, $R_{tm_j,t+k}$ is the total market index return (measured in US dollars) of target market *j* in period *t+k*, and $R_{tm_{\sim j},t+k}$ is the total market index return (measured in US dollars) on other target markets (other than target market *j*) with firm *i*'s cross-listings in period *t+k*. The lead and lag terms are included in the above time-series regressions to account for nonsynchronous trading across markets located in different time zones. The *bkl* measure is an *F*-statistic that quantifies the explanatory power of the unrestricted model (UR) relative to that of the restricted model (R). The *bkl* factor is defined as:

$$bkl = \frac{(R_{UR}^2 - R_R^2)/3}{(1 - R_{UR}^2)/(n - p + 1)} \qquad [4]$$

where *n* is the number of observations, and *p* is the number of parameters to be estimated in the unrestricted model (UR). The *bkl* factor is computed using weekly total return series from Datastream. We use the total return series of Datastream country index for home and target market returns. For each sample quarter and for each security with up to 2 secondary listings, we require at least 120 weeks of past total return data in computing *bkl*. To obtain reasonably precise estimates of the *bkl* factor for cross-listed shares with 3 to 4 secondary listings, we require a minimum of 160 weekly past total return data. The BKL model predicts that the higher the return correlation of the cross-listed security with other securities listed on the target market, the larger the target market share of trading volume. We expect the *bkl* factor to be positively associated with the *target market share of trading*.

2.3.2 Known firm-specific factors (cont'd)

{*size, relative industry capitalization, home market analyst, volatility, institutional ownership*}

Firm level information environment is likely to influence the trading volume distribution of cross-listed shares. Firm *size* may proxy for the visibility of the firm to target market investors. Larger market capitalization may indicate that the firm is better known to the investors in the target market. We control for firm *size* using the natural logarithm of the stock's quarterly average market capitalization in US dollars from Datastream. As another proxy for the firm visibility to the target market investors, we include the difference between the percentage of global industry market capitalization for the firm's industry in the target market and the percentage of global industry market capitalization for the firm's industry in the home market (*relative industry capitalization*) [Baruch et al. (2007)]. The *relative industry capitalization* variable is constructed using the Level 3 Datastream industry indices data (10 industry groups). We expect the proxies for firm visibility to be positively related to *the target market share of trading*.[16]

Furthermore, higher analyst coverage in the home market may lower information acquisition cost for foreign investors trading in the home market [Baruch et al. (2007)]. This reasoning predicts a negative association between the *home market analyst* coverage and the trading volume share of

[16] There is little empirical support for the aforementioned hypothesis. In fact, both Baruch et al. (2007) and Halling et al. (2008) find that firm *size* is negatively related to the trading activity in target market.

target market.[17] Following Baruch et al. (2007), I measure the extent of *home market analyst* coverage using the natural logarithm of one plus the number of 1-year-ahead earnings-per-share (EPS) estimates for the home market security. Analyst EPS estimates are from the International Summary data of I/B/E/S, and I use the quarter-end values.

Halling et al. (2008) shows that the sensitivity to private information affects the distribution of target market share of trading activity. If private information originates in the target market, then investors in the target market may have informational advantage, leading to larger share of trading in the target market. It is shown that firms with higher return volatility are more sensitive to private information. Halling et al. (2008) find a positive association between return *volatility* and the target market trading share. We estimate the return *volatility* as the quarterly standard deviation of weekly home market security returns using data from Datastream.

Lastly, we control for *institutional ownership* as global institutional investors' selection of trading venues in trading cross-listed securities may influence the target market share of trading volume. It would be ideal to have global institutional investor trading record at the transaction level. However, transaction level datasets are often proprietary in nature. We instead use FactSet Global Institutional Ownership database.[18] One notable advantage of using FactSet Global Institutional Ownership database is that FactSet Global Institutional Ownership database has a comprehensive coverage of global institutional ownership around the world unlike Thomson

[17] The extent of analyst coverage in the home market may also proxy for the amount of information available to the general public. This interpretation makes the relationship between the analyst coverage in the home market and the target market share of trading rather unclear.

[18] FactSet Global Institutional Ownership dataset is only used in a few studies: Bartram, Griffin, and Ng (2010) and the papers co-authored mainly by Ferreira and Matos.

Financial's 13F database, which only includes US institutional ownership.[19] For each firm i and each sample quarter t, we compute the *institutional ownership* as the percentage of the company's total market capitalization (in US dollars) owned by institutions.

2.3.3 Known market-specific factors

{*geographical distance, hm low investor protection, relative transaction cost, relative market turnover*}

Literature has shown that geographical proximity plays an important role in information flows [Prinsky and Wang (2006); Coval and Moskowitz (2001); Pulatkonak and Sofianos (1999); Sarkissian and Schill (2004); Baruch et al. (2007); Halling et al. (2008)]. Baruch et al. (2007) and Halling et al. (2008) demonstrate that the closer the US markets to the home market of the firm, the higher the US share of trading activity. We measure geographical proximity in terms of *geographical distance* (in miles) between the target and the home market of the security. We expect a negative relation between the target market share of trading volume and the *geographical distance*.

Halling et al. (2008) argue that investors would prefer to trade on the stock exchanges with stricter and better enforced rules against insider trading as better legal protection against insider trading reduces adverse selection costs for market participants. If this is the case, then we would expect to observe a larger target market share of trading for target markets with better investor protection. Furthermore, if the home market features poor investor protection, then foreign investors may divert their trading of cross-listed stocks away from the home market to a foreign

[19] Bartram, Griffin, and Ng (2010) and Ferreira and Matos (2008) provide detailed discussions on the institutional investor coverage of the FactSet Global Institutional Ownership database.

target market. To measure investor protection of home markets, we create an indicator variable, *hm low investor protection*, that takes the value 1 if the investor protection index score of a home market is less than 4 (scale from 0 to 10, 10 being the highest score) and 0 otherwise. The values of the investor protection index are drawn from La Porta, Lopez-de-Silanes, and Shleifer (2006).

Transaction costs and liquidity play an important role in the ability of markets to attract trading volume [Chowdhry and Nanda (1991); Domowitz, Glen, and Madhavan (1998)]. Those target markets with lower transaction costs would host a larger portion of trading activity. To account for this, we measure the *relative transaction cost* between the target and the home market using the institutional investors' transaction costs data from Elkins McSherry. Elkins McSherry's transaction costs consist of quarterly commission, fees, and market impact costs in basis points. We then subtract the quarterly transaction costs of trading in the home market from that of at the target market to generate the estimates for the *relative transaction cost*. We expect a negative relation between the *relative transaction cost* and the trading volume share of target market.

Furthermore, we control for the difference in the level of overall market trading activity in regression analyses. We measure the level of overall market trading activity in terms of total turnover scaled (in US dollars) by total market capitalization (in US dollars). We take the quarterly average of the scaled weekly market turnover. The *relative market turnover* is defined as the difference in the quarterly average scaled turnover of the target and that of the home market of the cross-listed security. We use the Datastream country index data to compute the *relative market turnover*.

2.4 Summary statistics

We present the trading volume distribution of cross-listed securities across 19 target markets (2 US and 17 non-US host markets) in Table 2.3. The *target market share of trading* is the ratio of weekly dollar amount traded on target market (in US dollars) to the weekly total dollar amount traded (in US dollars) averaged over one quarter. The total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market of the firm. Table 2.3 summarizes the average *target market share of trading* for each of the 19 target markets around the Morrison ruling. We define “Morrison quarter” to be the second quarter of 2010 as the US Supreme Court ruled on the Morrison case on June 24, 2010. Furthermore, we define “before Morrison” period to be the three quarters preceding the “Morrison quarter” (the third quarter of 2009, the fourth quarter of 2009, and the first quarter of 2010), and “after Morrison” period to be the three quarters following the “Morrison quarter” (the third quarter of 2010, the fourth quarter of 2010, and the first quarter of 2011). The average values are calculated first by averaging over time for each cross-listing and then by computing the average within each target market. The overall mean value for the *target market share of trading* is 31%. However, there are substantial variations in the *target market share of trading* across target bourses. Among the target exchanges that host larger number of cross-listings, US markets grab larger share of trading than the others. The London Stock Exchange, which hosts the largest number of cross-listings among the non-US target markets, attracts only 23% of global trading volume. In fact, most non-US target bourses host relatively small share of global trading volume.

Table 2.3 also reports the mean values of *target market share of trading* before, during, and after the "Morrison quarter" by target markets. For US markets, before the "Morrison quarter," the average *target market share of trading* is 45%. During and also after the "Morrison quarter," the average US market share of trading volume increases to 48%. The increase in the US share of trading volume is only about 7% comparing before and after the "Morrison quarter." On the other hand, we observe that the average *target market share of trading* virtually unchanged around 19% before, during, and after the "Morrison quarter" for non-US target markets. Table 4 Panel A and B tabulate the summary statistics of known control variables grouped by target markets. All mean values in Table 3 are calculated first by taking the time-series averages of the variables for each cross-listing and then by computing the average within each target market.

2.5 Multivariate analyses

In this section, we examine the impact of the Morrison ruling on the US share of trading volume for US cross-listed stocks through difference-in-differences regression analyses, while controlling for known determinants that explain the distribution of target market share of trading volume. The dependent variable in regressions is the logistic transformation of weekly *target market share of trading* averaged over one quarter (defined in [1], section III).[20] The quarterly panel includes 4,485 observations (security-target market-quarter) for 641 cross-listed securities (338 cross-listings on US markets and 303 cross-listings on non-US target markets) ranging from the third quarter of 2009 to the first quarter of 2011 (three quarters before and after the Morrison

[20] The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. We compute the *target market share of trading* at weekly frequency, and these ratios are averaged over 1 quarter. We then take the natural log of these quarterly averaged ratios.

ruling). We do not allow securities to enter and exit the panel over time due to new listing or delisting. Following Baruch et al. (2007) and Halling et al. (2008), all explanatory variables are lagged by one quarter in regressions. We estimate pooled ordinary least squares (pooled OLS) regressions with robust standard errors. In all regression specifications, standard errors are robust to heteroskedasticity. Furthermore, we cluster standard errors by firm. This allows for potential correlation among observations of the same firm across different quarters.

The difference-in-differences regression assesses the effect of the Morrison by using a control group to subtract other changes around the Morrison ruling, assuming these other changes were identical between the treatment group (cross-listings on US markets) and the control group (cross-listings on 17 non-US target markets). For our difference-in-differences regression analyses, we define the following indicator variables. The *morrison* indicator variable takes the value 1 for the second quarter of 2010 (in which the Supreme Court ruling on the Morrison case took place) and 0 otherwise. The *after morrison* dummy takes the value 1 for each quarter subsequent to the second quarter of 2010 (the third quarter of 2010, the fourth quarter of 2010, and the first quarter of 2011). Furthermore, we create an indicator variable for cross-listed stocks on US market, *US target*, which is 1 for US cross-listings and 0 otherwise. The *US home* dummy takes the value 1 for cross-listings with US home markets and 0 otherwise. Lastly, we interact both *US target* and *US home* with *morrison* and *after morrison*, respectively.

2.5.1 Baseline results

Table 2.5 reports the baseline regression estimation results. In Table 2.5, model (1), (2), (3), and (4) are estimated using the entire sample. Model (1) and (2) examine whether and how the US share of trading volume for US cross-listed stocks has changed around the Morrison ruling. Model (1) and (2) differ only by the inclusion of quarter-fixed effects in model (2). The interaction variables, *interaction term (morrison & US target)* and *interaction term (after morrison & US target)*, are the key variables. The estimation results in model (1) serves as our base case.

In model (1), the coefficients on *interaction term (morrison & US target)* and *interaction term (after morrison & US target)* are both positive, and they are statistically significant at the 1% level. The coefficient associated with *interaction term (morrison & US target)* is 0.326, and this states that during the quarter of the Morrison ruling, the US share of trading volume of cross-listed stocks on US markets is larger by 38% (=exp(0.326)-1) compared to that of cross-listed stocks on non-US target markets. Furthermore, after the Morrison decision, the US share of trading volume for cross-listed stocks on US markets is higher by 28% (=exp(0.251)-1) compared to the trading volume share of cross-listed securities on non-US target markets. Model (2) includes quarter fixed-effects, and there is no material difference in the size of the coefficients in model (1) and (2).

Model (3) and (4) examine whether multimarket trading dynamics of cross-listed securities of US firms have materially changed around the Morrison decision. We observe that the estimated coefficient of *US home* is negative, and it is statistically significant at the 1% level. The coefficient value, -2.312, on *US home* indicates that the target market share of trading volume for US firms is significantly smaller, by 90%. The coefficients for both *interaction term (morrison & US home)* and *interaction term (after morrison & US home)* are negative, but they are not statistically significant. Unlike cross-listed securities on US markets, multimarket trading dynamics of cross-listed stocks for US firms on non-US target markets are largely unaffected by the Morrison ruling.

The coefficient estimates of control variables in the base case specification are mostly consistent with our hypotheses. All coefficients of statistically significant independent variables have the expected signs. The estimated coefficient on *bkl* is positive indicating that the target market share of trading is larger if the target market contributes more to price discovery. A one standard deviation (3.36) increase in *bkl* results in a 21% (=exp(0.058*3.36)-1) increase in trading volume share of the target market. The estimated coefficient on *relative market turnover* is positive and significant indicating that the level of overall target market trading activity matters. A one standard deviation (2.72) increase in *relative market turnover* leads to a 190% (=exp(0.391*2.72)-1) increase in the target market share of trading. The indicator variable, *hm low investor protection*, is statistically insignificant in model (1).

2.5.2 Results on U.S. cross-listings

In this section, we report the estimation results on the sample of US cross-listed stocks. The regression estimates are reported in Table 2.6. To examine whether the impact of the Morrison ruling is different in magnitude for US cross-listed stocks with home markets that feature poor investor protection, we create interaction terms, *interaction term (morrison & hm low investor protection)* and *interaction term (after morrison & hm low investor protection)*. The estimation results in models (5) through (8) are based on the sample of US cross-listed stocks. Model (6) and (8) include quarter fixed-effects. From model (5), we note that the coefficient of *hm low* *investor protection* is positive, and it is statistically significant at the 1 % level. The coefficient of 0.385 for *hm low investor protection* indicates that the US share of trading volume for firms with home markets that have poor investor protection is larger by 47% (=exp(0.385)-1). Furthermore, in model (7), the coefficient associated with *interaction term (after morrison &hm low investor protection)* is 0.117, statistically significant at the 5% level, which indicates that the US share of trading volume for firms with home markets that feature poor investor protection is larger by additional 12% (=exp(0.117)-1).

We investigate whether our results on firms from home markets with poor investor protection is driven mainly by US cross-listed firms from emerging economies. We define an indicator variable, *hm emerging market*, which takes the value 1 when the home country of a US cross-listed firm is classified as an emerging economy (under International Financial Corporation (IFC) of the World Bank Group classification) and 0 otherwise. We interact *hm emerging market* with indicators variables, *morrison* and *after morrison*. The estimation results are shown in Table 2.6, model (9) and (10). Model (10) includes quarter fixed-effects. In model (9), the estimated coefficient on *hm emerging market* is positive and statistically significant at the 1% level. The estimated coefficient of 0.456 shows that the US share of trading volume for firms from emerging economies is higher by 57%. However, the coefficient of *interaction term (after morrison & hm emerging market)* is negative, -0.132, which translates to lower US share of trading volume of 12% after the Morrison ruling for firms domiciled in emerging countries. This implies that our results on firms from home markets with poor investor protection in model (7) and (8) are not driven by emerging market firms with US cross-listings.

In summary, our results indicate that for US cross-listed foreign firms, the US market share of trading volume has increased by 28% after the Morrison decision. Furthermore, among the US cross-listed firms, the US share of trading volume is higher by additional 12% for firms with the home markets that feature poor investor protection laws after the Morrison ruling. Lastly, the multimarket trading dynamics of US firms with cross-listing on non-US target markets is largely unaffected by the Morrison decision.

2.6 Conclusion

We study the impact of abrupt change in the US investor protection laws on the location of stock trading for firms with US cross-listings. The US Supreme Court's ruling in the case of *Morrison vs. National Australia Bank* in June 2010 communicates that civil liability for securities fraud applies only to securities listed on US markets and to security transactions taken place in the US. As a result of this decision, non-US firms with cross-listings on US markets were suddenly shielded from civil liability claims by the US investors who purchased their shares in the counterpart home markets. Furthermore, investors who purchased shares of US companies in non-US markets can no longer be protected by fraud-related provisions of US securities laws.

Using a sample of 641 cross-listed stocks on US and non-US host markets around the world, we investigate whether and how the multimarket trading dynamics of US cross-listed stocks changed around the US Supreme Court's ruling on the Morrison case. Our results indicate that for US cross-listed foreign firms, the US market share of trading volume has increased by 28% after the Morrison decision. Furthermore, among the US cross-listed firms, the US share of trading volume is higher by additional 12% for firms with the home markets that feature poor investor protection laws after the Morrison ruling.

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Table 2.1:

This table reports the distribution of cross-border listings across 2 US and 17 non-US target ("host") exchanges grouped by home market region and home country's degree of economic development (developed vs. emerging). We use the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group. Each cell in the table represents the number of cross-listings. There are 939 cross-listed securities (secondary listings) during the period between the third quarter of 2009 and the first quarter of 2011.

Number of cross-listed securities

		home market region									
	target market	Developed Americas	Developed Asia	Developed Europe	Developed Middle East	Emerging Africa	Emerging Americas	Emerging Asia	Emerging Europe	Emerging Middle East	total
US	NASDAQ	37	4	18	27	1	7	2	1	.	97
	New York	127	11	79	3	5	67	34	2	1	329
US Total		164	15	97	30	6	74	36	3	1	426
Asia	Australia	10	17	7	.	1	.	.	.	.	35
	Hong Kong	3	1	2	.	.	.	58	.	.	64
	Singapore	.	11	.	.	.	.	4	.	.	15
	Taiwan	.	1	.	.	1	.	.	.	.	2
	Tokyo	6	.	1	.	.	.	2	.	.	9
Americas	Lima	14	.	3	.	.	.	.	.	.	17
	Toronto	14	13	6	.	1	.	.	.	.	34
Europe & Africa	Euronext Amsterdam	5	.	17	.	.	.	.	.	.	22
	Euronext Brussels	2	.	3	1	1	.	.	.	.	7
	Euronext Lisbon	.	.	2	.	.	.	.	.	.	2
	Euronext Paris	13	.	10	.	3	1	.	.	.	27
	Frankfurt	13	.	23	.	.	.	.	.	.	36
	London	38	16	70	.	6	.	10	21	2	163
	Luxembourg	.	.	4	.	.	.	10	.	.	14
	Oslo	4	.	2	.	.	.	.	.	.	6
	Swiss	16	.	11	.	.	1	.	.	.	28
	Johannesburg	8	2	20	.	2	.	.	.	.	32
Non-US Total		146	61	181	1	15	2	84	21	2	513

Table 2.2:

Table 2.2 presents the distribution of cross-listed securities across 19 target exchanges (2 US and 17 non-US target markets) grouped by 10 industries during the period between the third quarter of 2009 and the first quarter of 2011. We use the Level 3 Datastream industry classification (10 industry groups). Each cell in the table represents the number of cross-listings.

Number of cross-listed securities

		industry										
	target market	Oil & Gas	Basic Materials	Industrials	Consumer Goods	Health Care	Consumer Services	Telecom	Utilities	Financials	Technology	total
US	NASDAQ	7	5	9	5	18	7	5	.	4	37	97
	New York	38	93	25	29	12	21	34	14	48	15	329
US Total		45	98	34	34	30	28	39	14	52	52	426
Asia	Australia	4	11	3	1	5	6	2	.	3	.	35
	Hong Kong	3	12	21	3	2	5	.	4	10	4	64
	Singapore	.	1	3	1	1	1	1	1	4	2	15
	Taiwan	.	.	.	.	1	.	.	.	.	1	2
	Tokyo	.	2	.	.	.	.	1	1	5	.	9
America	Lima	.	9	2	.	.	1	1	.	3	1	17
	Toronto	3	28	.	1	1	.	.	.	.	1	34
Europe & Africa	Euronext Amsterdam	2	.	3	1	.	.	3	1	5	7	22
	Euronext Brussels	1	1	1	1	1	1	.	.	1	.	7
	Euronext Lisbon	.	.	.	.	.	.	.	.	2	.	2
	Euronext Paris	1	6	4	6	2	2	1	.	3	2	27
	Frankfurt	.	6	10	6	3	2	.	1	3	5	36
	London	16	43	24	17	5	12	8	2	24	12	163
	Luxembourg	1	3	2	2	1	.	1	.	2	2	14
	Oslo	2	1	.	.	1	2	.	.	.	.	6
	Swiss	2	6	5	5	5	.	.	1	3	1	28
	Johannesburg	.	20	3	3	.	.	.	1	5	.	32
Non-US Total		35	149	81	47	28	32	18	12	73	38	513

Table 2.3:

This table summarizes the average *target market share of trading* across 2 US and 17 non-US target ("host") exchanges around the Morrison ruling in June 2010. For each cross-listed security of firm *i* traded on target market *j*, the *target market share of trading* is defined as the ratio of dollar amount traded on target market *j* (in US dollars) to the total dollar amount traded (in US dollars). The total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market for firm *i*. The *target market share of trading* is computed at weekly frequency, and these ratios are averaged over 1 quarter. The average values are calculated first by averaging over time for each cross-listing and then by computing the average within each target market. We define "Morrison quarter" to be the second quarter of 2010 as the US Supreme Court ruled on the Morrison case on June 24, 2010. Furthermore, we define "before Morrison" period to be the three quarters preceding the "Morrison quarter" (the third quarter of 2009, the fourth quarter of 2009, and the first quarter of 2010), and "after Morrison" period to be the three quarters following the "Morrison quarter" (the third quarter of 2010, the fourth quarter of 2010, and the first quarter of 2011).

Average *target market share of trading*

			target market share of trading volume			
	target market	num. of cross-listings	average	before Morrison	Morrison	after Morrison
US	NASDAQ	97	0.58	0.55	0.59	0.59
	New York	329	0.43	0.42	0.44	0.43
US mean		426	0.46	0.45	0.48	0.48
Asia	Australia	35	0.25	0.25	0.26	0.25
	Hong Kong	64	0.31	0.30	0.34	0.31
	Singapore	15	0.11	0.12	0.11	0.10
	Taiwan	2	0.64	0.52	0.64	0.75
	Tokyo	9	0.00	0.00	0.00	0.00
Americas	Lima	17	0.16	0.18	0.15	0.15
	Toronto	34	0.17	0.19	0.17	0.15
Europe & Africa	Euronext Amsterdam	22	0.10	0.10	0.10	0.10
	Euronext Brussels	7	0.35	0.36	0.35	0.33
	Euronext Lisbon	2	0.00	0.00	0.00	0.00
	Euronext Paris	27	0.11	0.12	0.11	0.10
	Frankfurt	36	0.06	0.07	0.07	0.05
	London	163	0.23	0.22	0.23	0.24
	Luxembourg	14	0.00	0.00	0.00	0.00
	Oslo	6	0.51	0.52	0.50	0.51
	Swiss	28	0.03	0.03	0.03	0.03
	Johannesburg	32	0.22	0.22	0.22	0.23
non-US mean		513	0.19	0.19	0.20	0.19
Overall		939	0.31			

Table 2.4: Panel A

This table reports the summary statistics. All mean values are calculated first by taking the time-series averages of the variables for each cross-listing and then by computing the average within each target ("host") market. Panel A of Table 2.4 presents the mean values of firm-specific variables for each target market. The *bkl* factor is estimated using equations [2], [3], and [4] in Section 2.3.2. Firm *size* is the firm's quarterly average market capitalization in billions of US dollars from Datastream. The *relative industry capitalization* is the difference between the percentage of global industry market capitalization for the firm's industry in the target market and the percentage of global industry market capitalization for the firm's industry in the home market. The *relative industry capitalization* variable is constructed using the Level 3 Datastream industry indices data (10 industry groups). The *home market analyst* is the number of 1-year-ahead earnings-per-share (EPS) estimates for the home market security. Analyst EPS estimates are from the International Summary data of I/B/E/S, and the quarter-end values are used. The *volatility* is the quarterly standard deviation of weekly home market security returns using data from Datastream. For each firm *i* and each sample quarter *t*, we compute the *institutional ownership* as the percentage of the company's total market capitalization (in US dollars) owned by institutions. We use FactSet Global Institutional Ownership database for the *institutional ownership* variable.

		firm-specific factors					
	target market	bkl	size	rel. industry cap.	home mrkt. analyst	volatility	instituional ownership
US	NASDAQ	3.5	4.1	0.45	6.0	6.6	33.1
	New York	3.4	20.7	0.22	8.2	5.5	32.0
US mean		3.4	16.9	0.27	7.8	5.7	32.2
Asia	Australia	2.3	3.8	-0.07	5.5	6.5	20.1
	Hong Kong	2.3	24.3	0.00	6.5	5.0	10.6
	Singapore	2.3	1.3	-0.01	4.3	6.0	4.2
	Taiwan	1.2	0.0	0.05	1.9	6.4	23.2
	Tokyo	1.6	70.4	-0.09	9.7	5.2	46.3
Americas	Lima	3.2	42.1	-0.16	12.2	7.0	27.9
	Toronto	3.4	0.7	-0.06	3.1	9.2	22.2
Europe & Africa	Euronext Amsterdam	3.7	59.1	-0.13	16.5	5.4	22.2
	Euronext Brussels	2.8	52.2	-0.10	8.5	4.1	20.2
	Euronext Lisbon	1.9	59.6	-0.03	18.1	6.2	10.9
	Euronext Paris	2.5	47.0	-0.14	9.1	4.4	39.6
	Frankfurt	3.6	9.6	-0.10	8.0	5.9	26.2
	London	2.4	17.7	0.01	6.9	6.9	16.8
	Luxembourg	1.8	27.6	-0.03	12.4	5.1	11.5
	Oslo	2.4	1.5	-0.13	6.1	10.8	22.4
	Swiss	3.2	44.2	-0.20	13.0	4.7	50.0
	Johannesburg	3.5	9.3	-0.07	6.0	7.7	19.6
non-US mean		2.7	22.0	-0.05	7.8	6.3	21.3
Overall		3.0	19.7	0.10	7.8	6.1	26.4

Table 2.4: Panel B

Panel B of Table 2.4 presents the mean values of market-specific variables for each target market. All mean values are calculated first by taking the time-series averages of the variables for each cross-listing and then by computing the average within each target ("host") market. The *geographical distance* (in miles) is the distance between the target and the home market of the security. The *home market investor protection* is the investor protection index score of the counterpart home market. The values of the investor protection index are drawn from La Porta, Lopez-de-Silanes, and Shleifer (2006). The *relative transaction cost* is constructed using the institutional investor transaction costs data from Elkins McSherry. We use the quarterly commission, fees, and market impact costs in basis points for each market in the sample. We then subtract the quarterly transaction costs of trading in the home market from that of at the target market to generate the estimates for the *relative transaction cost*. The *relative market turnover* is defined as the difference in the quarterly average scaled (scaled by total market capitalization) turnover of the target and that of the home market of the cross-listed security. Data for *relative market turnover* comes from Datastream. The details of variable construction are provided in Section 2.3.3.

		market-specific factors			
	target market	geo. distance	home market inv. protection	rel. transaction cost	rel. market turnover
US	NASDAQ	3425	7.2	-14.0	3.64
	New York	3344	6.8	-14.5	3.50
US mean		3362	6.9	-14.4	3.53
Asia	Australia	5947	7.7	-3.3	0.28
	Hong Kong	1182	4.2	-18.7	-1.99
	Singapore	2246	6.9	-4.6	-0.58
	Taiwan	4599	8.0	12.2	0.72
	Tokyo	5690	8.7	-6.0	-1.74
Americas	Lima	4164	9.3	35.7	-2.85
	Toronto	4726	8.3	1.5	-1.66
Europe & Africa	Euronext Amsterdam	1186	5.5	-4.3	-0.03
	Euronext Brussels	2213	7.4	-4.8	-0.52
	Euronext Lisbon	313	6.0	-1.7	-1.16
	Euronext Paris	2720	8.4	-8.2	-1.54
	Frankfurt	2052	5.8	-0.3	-2.65
	London	3227	7.0	5.6	-0.38
	Luxembourg	3372	5.9	-12.2	-0.85
	Oslo	2622	8.6	-4.1	0.05
	Swiss	2639	7.1	-0.7	-1.56
	Johannesburg	6038	8.1	0.7	-0.14
non-US mean		3226	6.8	-0.8	-1.00
Overall		3288	6.9	-7.0	1.07

Table 2.5

Table 2.5 reports the baseline regression results. The quarterly panel includes 4,485 observations (security-target market-quarter) for 641 cross-listed securities ranging from the third quarter of 2009 to the first quarter of 2011.The regressions are estimated using pooled OLS method. The dependent variable in the regressions is the logistic transformation of weekly *target market share of trading* averaged over 1 quarter. The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. Model (1), (2), (3), and (4) are estimated using the entire sample. The *morrison* indicator variable takes the value 1 for the second quarter of 2010 (in which the Supreme Court ruling on the Morrison case took place) and 0 otherwise. The *after morrison* dummy takes the value 1 for each quarter subsequent to the second quarter of 2010 (the third quarter of 2010, the fourth quarter of 2010, and the first quarter of 2011). Furthermore, we create an indicator variable for cross-listed stocks on US market, *US target*, which is 1 for US cross-listings and 0 otherwise. The *US home* dummy takes the value 1 for cross-listings with US home markets and 0 otherwise. Lastly, we interact both *US target* and *US home* with *morrison* and *after morrison*, respectively. The independent variable description is provided in Section 2.3.2 and 2.3.3. The standard errors are robust to clustering by firm.

Baseline regression results

	(1)	(2)	(3)	(4)
bkl	0.058**	0.059**	0.056**	0.056**
	[0.025]	[0.025]	[0.025]	[0.025]
rel. industry cap.	2.442***	2.379***	2.143***	2.088***
	[0.619]	[0.617]	[0.540]	[0.541]
size	-0.077	-0.067	-0.049	-0.043
	[0.064]	[0.064]	[0.061]	[0.061]
home market analyst	-0.995***	-1.011***	-1.080***	-1.086***
	[0.176]	[0.176]	[0.173]	[0.173]
volatility	-0.001	0.008	0.001	0.008
	[0.015]	[0.016]	[0.015]	[0.016]
geo. distance	-0.336***	-0.334***	-0.197***	-0.202***
	[0.073]	[0.073]	[0.073]	[0.073]
rel. transaction cost	-0.020***	-0.020***	-0.021***	-0.021***
	[0.005]	[0.005]	[0.004]	[0.004]
rel. mrkt. turnover	0.391***	0.415***	0.366***	0.380***
	[0.072]	[0.073]	[0.056]	[0.057]
hm low inv. protection	-0.297	-0.308	-0.308	-0.314
	[0.295]	[0.293]	[0.290]	[0.289]
institutional ownership	-0.010***	-0.010***	0.007**	0.006*
	[0.003]	[0.003]	[0.003]	[0.003]
morrison	-0.189**	-0.256***	0.053	-0.018
	[0.085]	[0.092]	[0.047]	[0.052]
after morrison	-0.021	-0.009	0.156***	0.167***
	[0.079]	[0.080]	[0.045]	[0.046]
US target	0.616	0.524		
	[0.417]	[0.421]		
int. (morrison & US target)	0.326***	0.331***		
	[0.086]	[0.086]		
int. (after morrison & US target)	0.251***	0.257***		
	[0.087]	[0.087]		
US home			-2.312***	-2.216***
			[0.586]	[0.589]
int. (morrison & US home)			-0.229	-0.227
			[0.236]	[0.236]
int. (after morrison & US home)			-0.252	-0.255
			[0.193]	[0.191]
Constant	0.398	0.445	-0.459	-0.379
	[0.666]	[0.668]	[0.654]	[0.655]
Quarter Fixed-Effects	No	Yes	No	Yes
Observations	4,485	4,485	4,485	4,485
Adj R-Squared	0.512	0.514	0.526	0.528

Standard errors robust to clustering by firm; *** p<0.01, ** p<0.05, * p<0.1

Table 2.6

Table 2.6 reports the regression estimations for the familiarity bias hypothesis. The regressions are estimated using pooled OLS method. The dependent variable in the regressions is the logistic transformation of weekly *target market share of trading* averaged over 1 quarter. The *target market share of trading* is defined as the ratio of dollar amount traded on the target market (in US dollars) to the total dollar amount traded (in US dollars). For each firm, the total dollar amount traded is the sum of the dollar amount traded on all target markets and the dollar amount traded on the home market. The estimation results in models (5) through (10) are obtained by using the sample of US cross-listings. The indicator variable, *hm low investor protection*, that takes the value 1 if the investor protection index score of a home market is less than 4 (scale from 0 to 10, 10 being the highest score) and 0 otherwise. The values of the investor protection index are drawn from La Porta, Lopez-de-Silanes, and Shleifer (2006). The indicator variable, *hm emerging market*, which takes the value 1 when the home country of a US cross-listed firm is classified as an emerging economy (under International Financial Corporation (IFC) of the World Bank Group classification) and 0 otherwise. The standard errors are robust to clustering by firm.

Regression results on US cross-listings

	(5)	(6)	(7)	(8)	(9)	(10)
bkl	0.028***	0.025**	0.028***	0.025**	0.022**	0.019**
	[0.010]	[0.010]	[0.010]	[0.010]	[0.009]	[0.010]
rel. industry cap.	0.299	0.336	0.298	0.335	0.348	0.377
	[0.292]	[0.284]	[0.292]	[0.284]	[0.291]	[0.283]
size	-0.017	0.012	-0.017	0.011	-0.013	0.014
	[0.035]	[0.035]	[0.035]	[0.035]	[0.034]	[0.035]
home market analyst	-0.319***	-0.309***	-0.319***	-0.309***	-0.250***	-0.243***
	[0.090]	[0.087]	[0.090]	[0.087]	[0.096]	[0.093]
volatility	0.013	0.035**	0.013	0.034**	0.015	0.037***
	[0.013]	[0.014]	[0.013]	[0.014]	[0.013]	[0.013]
geo. distance	-0.144**	-0.152**	-0.143**	-0.152**	-0.178***	-0.187***
	[0.062]	[0.062]	[0.062]	[0.062]	[0.068]	[0.067]
rel. transaction cost	-0.014***	-0.012**	-0.014***	-0.012**	-0.007*	-0.007
	[0.005]	[0.005]	[0.005]	[0.005]	[0.004]	[0.004]
rel. mrkt. turnover	0.289***	0.497***	0.290***	0.498***	0.328***	0.534***
	[0.050]	[0.068]	[0.050]	[0.069]	[0.050]	[0.069]
institutional ownership	0.016***	0.014***	0.016***	0.014***	0.015***	0.014***
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
morrison	0.222***	0.163***	0.207***	0.144***	0.265***	0.212***
	[0.031]	[0.033]	[0.035]	[0.037]	[0.038]	[0.038]
after morrison	0.244***	0.308***	0.226***	0.287***	0.279***	0.360***
	[0.034]	[0.038]	[0.037]	[0.040]	[0.041]	[0.044]
hm low inv. protection	0.385***	0.289**	0.320**	0.214*		
	[0.133]	[0.121]	[0.140]	[0.129]		
int. (morrison & hm low inv. protection)			0.095	0.115*		
			[0.061]	[0.065]		
int. (after morrison & hm low inv. protection)			0.117**	0.134**		
			[0.055]	[0.057]		
hm emerging mrkt					0.456***	0.435***
					[0.142]	[0.144]
int. (morrison & hm emerging mrkt)					-0.108**	-0.152***
					[0.047]	[0.054]
int. (after morrison & hm emerging mrkt)					-0.132**	-0.181***
					[0.051]	[0.056]
Constant	-1.820***	-2.526***	-1.813***	-2.519***	-1.815***	-2.519***
	[0.486]	[0.499]	[0.486]	[0.499]	[0.499]	[0.515]
Quarter Fixed-Effects	No	Yes	No	Yes	No	Yes
Observations	2,179	2,179	2,179	2,179	2,186	2,186
Adj R-Squared	0.411	0.448	0.411	0.448	0.411	0.451

Standard errors robust to clustering by firm; *** p<0.01, ** p<0.05, * p<0.1

CHAPTER 3

INSTITUTIONAL INVESTORS AND EXCESS COMOVEMENT IN RETURNS: EVIDENCE FROM CROSS-LISTED STOCKS AROUND THE WORLD

3.1 Introduction

Classical finance theories predict that security return comovement is fully explained by common variation in cash flows and discount rates. Recent studies show that security prices comove in excess of common fundamental factors. Extensive empirical literature shows that in many countries and in many markets, stocks tend to comove more with index stocks after they are added to an index [Wurgler and Zhuravskaya (2002); Chen, Noronha, and Singal (2004); Greenwood (2008)]. The presence of such asset-class effects has been documented for stocks, sovereign bonds, and commodity futures [Barberis, Shleifer, and Wurgler (2005); Boyer (2011); Rigobon (2002); Tang and Xiong (2012)]. In interpreting this evidence, some have suggested that excess comovement of stock returns may be due to the price impact of correlated investor demand or common liquidity shocks [Pindyck and Rotemberg (1993); Lee, Shleifer, and Thaler (1991); Froot and Dabora (1999); Morck, Yeung, and Yu (2000); Karolyi, Lee, and van Dijk (2012)].

There is a growing body of empirical evidence that common variation in security returns is associated with particular trading patterns of certain investor groups, which is consistent with excess comovement in stock returns driven by commonality in investor demand [Barberis, Shleifer, and Wurgler (2005)]. Boyer (2011) shows that style-related (value vs. growth stocks) correlated trading patterns induce excess covariation in returns among stocks with similar bookto-market ratios. Kumar and Lee (2006) finds that correlated trades of retail investors are related to patterns of comovement in certain stock returns.

A comprehensive sample of globally cross-listed securities provides an ideal setting in which to study excess comovement and also the sources of excess comovement in security returns. Cross-listed shares on foreign hosting ("target") markets typically are direct claims or represent claims against the same set of risky cash flows as ordinary share listed on the home market. An important distinguishing characteristic of markets for cross-listed stocks is that trading of these near perfect substitute securities is distributed across multiple markets, the target and the counterpart home market, and also across investors in respective markets. Multiple studies have found that security prices are affected by the location of trading [Chan, Hameed, and Lau (2003); Froot and Dabora (1999); de Jong, Rosenthal, and van Dijk (2009); Gagnon and Karolyi (2009, 2010)]. In particular, Gagnon and Karolyi (2010) shows that returns on U.S. cross-listed stocks have higher systematic comovements with the U.S. market index and lower systematic comovements with home market index compared to their counterpart home market shares.

In this paper, we focus on the role of global institutional investors in examining excess return comovements of cross-listed and its equivalent home market shares with the target market and the counterpart home market, respectively. Our empirical tests are based on the theory developed by Basak and Pavlova (2013). Basak and Pavlova (2013) notes that institutional investors' compensation may be closely tied to relative performance of their own portfolio vis-à-vis some benchmark stock index. Compensation-induced incentives lead institutional investors to demand stocks that compose their benchmark stock index or stocks that are highly correlated with some benchmark index. Consequently, because of coordinated demand or trading driven by institutional investors, the returns of stocks with high institutional ownership are more correlated amongst themselves.

Using 1,666 cross-listed-home-market-share pairs on 19 target markets with 60 different home markets between 2001 and 2010, we document that the return differential between the cross-listed and its counterpart home market share is small, 0.8 basis points, on average. However, we find that the return differentials between the cross-listed and its ordinary home market share, though small, exhibit excess return comovements relative to market index returns, the home and the target market returns. Furthermore, we test whether the presence of institutional investors contribute to excess return comovements of cross-listed and its home market share with the respective markets, the target and the counterpart home market. We find that, in general, institutional investors domiciled in the home country intensify the excess comovement in the long (a cross-listed share)-short (the equivalent number of home market shares) pair returns with the home market returns. For U.S. cross-listed securities, unlike those secondarily listed on other target markets, stronger presence of home country institutional investors reduces the intensity of excess comovement in the long-short pair returns with the home market returns. Our results on excess comovement in returns with respect to target market returns are weaker. Target country institutional investors do not exert significant influence on the return dynamics of the long-short position. However, there is an important exception. For the cross-listed-home-market-share pairs with synchronous trading hours between the target and its counterpart home market, we find that institutional investors domiciled in target country exacerbate the excess comovement in the long-short position returns with the target market returns.

To the best of our knowledge, this is the first paper that links global institutional investors to excess return comovements observed in markets for cross-listed stocks. Many papers documented excess return comovements of U.S. cross-listed and its home market share with the respective markets, the U.S. market and the counterpart home market. These previous studies attributed the sources of these excess comovements to country, industry, and firm-specific factors that reflect impediments to arbitrage and market segmentation. We mainly focus on uncovering global institutional investors' influence on excess return comovements in global markets for cross-listings after controlling for barriers to arbitrage. Although our main focus in this paper is different from previous papers, we consider many variables that represent impediments to inter-market arbitrage activities, which are identified by important previous studies.

We offer another important contribution. Our paper includes comprehensive analyses on the return differentials between non-U.S. cross-listed and its counterpart home market share. The Literature has primarily examined U.S. cross-listed securities. Our sample consists of both U.S. and non-U.S. target cross-listings. Specifically, in addition to U.S. cross-listed securities, we also examine cross-listed stocks on 17 non-U.S. target markets. Our sample provides an ideal experimental setting with a large cross-section of firms, target and home markets from around the world. Earlier studies by Maldonado and Saunders (1983), Kato et al. (1991), Wahab et al. (1992), and Park and Tavokkol (1994) employed a small sample of ADRs from select countries, such as Australia, Japan and the U.K., and usually with weekly observed prices. Rosenthal and Young (1990), Froot and Dabora (1999), Bedi, Richards, and Tennant (2003), and de Jong, Rosenthal, and van Dijk (2009) study dual-listed companies ("Siamese twins"). Each of these studies finds large and systematic deviations from twin price parity, which they attribute to difference in tax, accounting, regulatory, governance and trading attributes. Furthermore, more recent papers use special intraday data for country-specific studies of relative price discovery in cross-listed and home-market shares, such as Grammig, Melvin, and Schlag (2004) for three stocks in Germany and Eun and Sabberwal (2002) in Canada. Lastly, Gagnon and Karolyi (2010) studies inter-market arbitrage using a sample of 506 U.S. cross-listed stocks from 35 different countries. None of these studies investigate the breadth of scope in our study of 1,666 cross-listed securities on 19 target markets from 60 different home countries.

3.2 Empirical design

In an integrated and frictionless global stock market, arbitrage should ensure the return deviations between the cross-listed (target market) security and its counterpart home market security is zero. If the arbitrage is perfect, then not only is the return differential between the cross-listed and its home market share zero, but also the return difference is not exposed to any systematic risks. However, a number of studies uncovered systematic components related to market returns and exchange rate changes in the returns of arbitrage portfolios [Froot and Dabora (1999); Barberis, Shleifer, and Wurgler (2005); Greewood (2008); de Jong, Rosenthal, and van Dijk (2009); Gagnon and Karolyi (2010)]. To capture potential systematic comovement in the return differentials between the target market share and its counterpart home market share with the returns of respective market index (the home and the target market) and with exchange rate changes, we consider a time series regression model of the daily return differentials between the target and the home market security on the contemporaneous, leading and lagged daily returns of the target market index, the home market index, and the relevant exchange rate. From Rosenthal and Young (1990), Kato et al. (1991), Wahab et al. (1992), Park and Tavokkol (1994), Froot and Dabora (1999), Bedi at al. (2003), de Jong et al. (2009), and Gagnon and Karolyi (2010), for each cross-listed security on target market *l* of firm *i*, we have:

$$r_{i,t}^{TM_l-HM} = \alpha_{i,l} + \sum_{j=-1}^{j=+1} \beta_j^{TM_l} r_{t+j}^{TM_l} + \sum_{j=-1}^{j=+1} \beta_j^{HM} r_{t+j}^{HM} + \sum_{j=-1}^{j=+1} \beta_j^{FX} r_{t+j}^{FX} + \varepsilon_{i,l,t} \quad (1)$$

where $r_{i,t}^{TM_l-HM}$ is the daily return difference between the target market (cross-listed) security and its counterpart home market security in terms of target country currency, $r_{t+j}^{TM_l}$ indicate the target market index daily return (denominated in target country currency), r_{t+j}^{HM} is the home market index return (denominated in home country currency), and r_{t+j}^{FX} is the currency return for the home country of firm *i* relative to the target country currency.[21] To account for asynchronous and non-synchronous trading hours between the target and the home market, the above time series regression model allows the return difference between the target market and its counterpart home market shares to covary with one-day lagged and leading currency and market returns in addition to coincident currency and market returns in (1).

The target country currency denominated return of home market index return can be decomposed as the sum of the home country currency return and the exchange rate change. We use this additive decomposition to assign each the home market index and currency factor its own regression coefficient in (1). The reason for separating out the two factors is to keep any

[21] $r_{i,t}^{TM_l-HM} = [\ln(P_{i,t}^{TM_l}/P_{i,t-1}^{TM_l}) - \ln(P_{i,t}^{HM}/P_{i,t-1}^{HM})] \times 100$

measurement error in one of the variables from affecting the coefficient of home market index returns and of the other currency change. The measurement error that we are primarily concerned about may stem from the cases where the exchange rate and the security prices denominated in the home country currency are recorded at different times during the day, and this could induce measurement error in the security prices denominated in the target country currency.

To accurately measure deviations between the returns of the target market security and its counterpart home market security, we need to match prices on each of the security pairs that are synchronous in time. In many occasions, the trading hours for most of target markets and home markets are different. Major European markets have synchronized trading hours, but these are the exceptions. For the two competing markets, the target and the home market, with non-synchronous but overlapping trading hours, it would be ideal to use intraday prices and quotes in obtaining computed returns based on synchronous time horizons, but we do not have intraday price and quote data for most of the markets in our sample, only their closing prices. An additional structural limitation results in non-synchronization of security return observations in the two competing markets. Some target and home markets in our sample have asynchronous trading hours. For instance, the cross-listed and its home market security pairs with Asian home markets and US target markets have completely non-synchronous trading hours. In addition to non-synchronous and asynchronous trading hours between the two competing markets, non-synchronous trading problem may arise when either the target market or the home market shares are traded only intermittently. Stocks that are less actively traded in the target or home market may have stale closing prices. Non-synchronous trading that stems from either non-synchronized trading hours or infrequent trading may affect return observations and, thus, can induce spurious cross-autocorrelations in cross-listed and home market share returns. This would artificially result in a mean-reverting structure in the return differentials between the cross-listed and its home market security [Froot and Dabora (1999)].

To incorporate potential mean-reverting structure, we include one-day lag term of the return difference between the target market and its home market shares in (1). In addition, in computing returns, we only use daily target market and home market security prices accompanied by strictly positive trading volume to filter out stale prices from infrequent trading. We modify (1) and choose the set of one-day leading and lagged market return variables to reflect the actual market closing time differentials between the target and the home market. Instead of including a leading and a lagged market returns for both the target and the home market, we include the lagged and contemporaneous market returns if the closing time of this market is earlier than the other competing market. The leading and contemporaneous market returns are included in the cases where the market closing time is later compared to the other competing market. We use only the contemporaneous market returns if the two competing markets have the exactly the same closing time after adjusting for time zone differences. Furthermore, we conservatively allow the return differences between the cross-listed and its home market security to covary with the one-day lagged and leading currency returns as well as the contemporaneous currency returns because there could be non-synchronous measurement of currency returns and stock returns due to non-synchronous trading hours between the stock market and the foreign exchange market.

With the above adjustments, we estimate the following time series regression to capture systematic comovement in the return differences between the cross-listed share and its counterpart home market share with the returns of the target market, the home market, and with the relevant exchange rate changes: using daily return data, given a sample year, for each cross-listed security on target market *l* of firm *i*, we estimate,

$$r_{i,t}^{TM_l-HM} = \alpha_{i,l_{-i}} + \beta_{i,l_{-i}}^{MR}\, r_{i,t-1}^{TM_l-HM} + \sum_{j=-1}^{j=+1} \beta_{j_{-i}}^{TM_l} r_{t+j}^{TM_l} + \sum_{j=-1}^{j=+1} \beta_{j_{-i}}^{HM} r_{t+j_{-i}}^{HM} + \sum_{j=-1}^{j=+1} \beta_{j_{-i}}^{FX} r_{t+j}^{FX} + \varepsilon_{i,l,t} \quad (2)$$

where $r_{i,t}^{TM_l-HM}$ is the daily return difference between the target market security and its counterpart home market security based on target country currency denomination, $r_{t+j}^{TM_l}$ indicates the target market index daily return (in terms of target country currency), $r_{t+j_{-i}}^{HM}$ is the home market index return (in terms of home market currency), and r_{t+j}^{FX} is the currency return for the home country of firm *i* relative to the target country currency.[22] In (2), if the closing time of the target market is earlier than the home market, then $\beta_{-1_{-i}}^{HM}$=0 and $\beta_{+1_{-i}}^{TM_l}$=0. We impose the restriction, $\beta_{+1_{-i}}^{HM}$=0 and $\beta_{-1_{-i}}^{TM_l}$=0, in (2) for the cases where the target market's closing time is later than that of the home market. When the closing time of the target and the home market is synchronized, we set $\beta_{-1_{-i}}^{HM}= \beta_{+1_{-i}}^{HM}= \beta_{-1_{-i}}^{TM_l}= \beta_{+1_{-i}}^{TM_l}$=0 in (2). We drop all terms on currency returns in (2) when the target and the home country have the same currency (e.g. the cases where the target and the home country use Euro).

The daily return series are computed using closing prices in estimating (2). We draw daily data from DataStream International. We use the DataStream country index to obtain market returns as this offers the least data constraint. DataStream country indices are market capitalization

[22] $r_{i,t}^{TM_l-HM} = [\ln(P_{i,t}^{TM_l}/P_{i,t-1}^{TM_l}) - \ln(P_{i,t}^{HM}/P_{i,t-1}^{HM})] \times 100$

weighted indices and represent at least 70% of the total country market capitalization. The most of firms represented in our sample are a component of the DataStream country index for the home country. Obviously, none of the cross-listed securities is a part of the DataStream country index for the target country. Consequently, the estimated regression coefficients on home market returns can be biased as the most of firms in our sample are a component of the home market index. This bias in the beta estimates on the home market returns would be more severe if a firm's market capitalization is large (i.e. a larger part of index capitalization). To eliminate any own-stock effects, we remove each firm's return contributions to the home market index returns. The subscript $-i$ in (2) indicates that the return contributions of firm i is removed in computing home market index returns. Furthermore, to obtain more accurate regression coefficient estimates in (2), given a sample year, we require at least 60 daily return observations accompanied by strictly positive trading volume for both the target and the home market security.

The time series regression model in (2) includes the one-day lag of the return difference between the target market and its counterpart home market shares.[23] The primary reason for the inclusion of the lag term of the return difference is to capture any effects of spurious cross-autocorrelation in the target market and home market share returns induced by non-synchronous trading.[24] It is also possible that the coefficient, $\beta^{MR}_{i,l_{-i}}$, on the lag term of the return difference captures the rate

[23] The inclusion of additional lags may be unnecessary as we only include consecutive trading days with strictly positive trading volume in return computation. Hence, it is rare to observe further delays (more than one day) in price correction or reaction to the return deviation from the previous day.

[24] Our multivariate regression analyses presented in the later sections consider controls for non-synchronous trading by including measures of the cross-listed and the home market security illiquidity and variables that measure the time zone difference and geographical distance between the target and the counterpart home market.

at which the return differentials decay as a result of trading by inter-market arbitrageurs in response to a return deviation between the cross-listed and the home market shares.[25] Arbitrage that exploits the return differentials between the cross-listed shares and its home market shares is most likely to be carried out global institutional investors. If indeed global institutional traders are active arbitrageurs in global equity markets, then the return deviations between the cross-listed securities and its home market securities should revert to zero. If the return differentials tend to revert towards some mean or zero, then we should find $\beta_{i,l_{-i}}^{MR}$ to be negative. The faster the return differentials revert to zero, the larger the negative value of $\beta_{i,l_{-i}}^{MR}$. Of course, it would be impossible to completely distinguish which effect that the one-day lag term of the return difference between the target market and its counterpart home market shares captures.

Our motivation for estimating the above time series regression in (2) is to capture the differential exposures of the cross-listed and its home market shares to the respective market index (the target and the home market index) fluctuations and the relevant foreign exchange rate changes, and to study the factors that explain the cross-sectional attributes of these differential exposures. From (2), for each sample year and for firm *i*, we define the net "excess" comovement home market beta, $net\ \beta_{-i}^{HM}$, to be the sum of all home market betas. The net "excess" comovement target market beta is defined similarly. If investors push up the local currency value of home market securities, then this may cause the return of the home market share of the firm to be higher relative to its cross-listed security return on the target market. In this hypothetical example, a decrease in the return difference, $r_{i,t}^{TM_l-HM}$, would be associated with a rise in the

[25] Alternatively, if the return difference between the target market and its counterpart home market shares contains a unit root, then the probability that the return differential becomes arbitrarily large over time is equal to one. However, we do not expect this to be the case.

home market index resulting in a negative net excess comovement beta on the home market index. In a similar manner, the net excess comovement betas for the return differential between the cross-listed and its counterpart home market share on the target market index would be positive.

In the next section, we introduce our main hypothesis and control variables, and describe variable construction.

3.3 Main hypothesis and key variables

The objective of this paper is to understand the factors that explain the cross-sectional and time-series attributes of the excess comovement market betas in (2). Our empirical tests are based on the theory of Basak and Pavlova (2013).

Basak and Pavlova (2013) proposes a theory that incorporates institutional investors' compensation incentives and their influence on asset prices. Basak and Pavlova (2013) notes that institutional investors' portfolio holdings are influenced by compensation-induced incentives or implicit incentives to increase asset under management arising from the predictability of capital inflows resulting from portfolio performance. Basak and Pavlova (2013) focus on one of most prominent features of institutional investors' incentives, which is the relative performance of their own portfolio vis-à-vis some benchmark stock index. This relative performance is important because new money inflows into institutional portfolios and payouts to asset managers at year end depend on it, or simply because managers care about their standing in the profession. Consequently, institutional investors hold stocks that compose their benchmark stock index. As a result, coordinated trading by institutional investors induce excess comovement among stocks that belong to their benchmark index.

One important implication of Basak and Pavlova (2013) is that institutional investors demand stocks that are highly correlated with some benchmark index and, thus, the returns of stocks that are well-owned by institutional investors are more correlated amongst themselves. Among global institutional investors in our setting, we hypothesize that institutional investors domiciled in the home country would have the incentive to hold and trade stocks that are highly correlated with home market stock returns as their relative performance vis-a-vis local stock market would be important to them for compensation or aforementioned implicit incentives. As a result, the coordinated demand and trading activities on these stocks by institutional investors domiciled in the home country is likely to induce excess comovement among these stocks and also with the home market index. Institutional investors domiciled in the target country would hold stocks that are highly correlated with the returns of target market index and coordinated demand on these stocks would induce excess comovement with the target market index. Specifically, we test whether the home country institutional investors' demand contribute to the excess comovement of the return differentials between the cross-listed and its counterpart home market share with the fluctuations of home market index. Parallel to this, we also examine whether the target country institutional investors induce the excess comovement of the return differentials with the target market index returns.

We measure institutional investors' trading activities for a stock using institutional ownership.[26] We construct our institutional ownership variable by using Lionshare/Factset Global Ownership dataset. Our paper is one of few papers that utilize Lionshare/Factset Global Ownership dataset in the study of cross-listed securities. Lionshare/Factset Global Ownership dataset offers comprehensive coverage of global institutional investors while 13-F filings only include US institutional investors. In Lionshare/Factset ownership dataset, the coverage on global institutions is most comprehensive from 2001 and on. Lionshare/Factset ownership dataset include all developed countries and most of emerging countries.[27] In Lionshare/Factset ownership dataset, the reporting frequency of institutional ownership varies across countries from quarterly to yearly, and to reconcile different report frequencies, we collect institutional ownership data in annual frequency. For each stock, Lionshare/Factset ownership data allows us to identify the number of shares held by each institution at year end. Lionshare/Factset ownership data also reports each institution's country of domicile.[28]

For each firm i and each sample year t, we define the home country institutional ownership denoted $IO(hc)_{i,t}$ as the percentage of market capitalization (measured in US dollars) of firm i held by institutions domiciled in the home country. Similarly, for each firm i and each sample year t, we define $IO(tc_l)_{i,t}$ as the percentage of market capitalization (measured in US dollars) held by institutions domiciled in the target country l. $IO(hc)_{i,t}$ and $IO(tc_l)_{i,t}$ are the key variables

[26] It would ideal to use institutional investors' transaction level data to measure their coordinated trading activities in respective markets, the target and the home market. However, it is difficult to obtain the transaction data of institutional investors as they are often proprietary in nature.
[27] This is based on the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group. Lionshare/Factset ownership data has little coverage on Middle Eastern countries and countries in Africa.
[28] Ferreira and Matos (2008) provides detailed discussion on Lionshare/Factset ownership data set.

in testing our main hypothesis. If the home country institutional investors' trading activities contribute to the excess comovement of the return differentials between the cross-listed and its counterpart home market share with the home market index returns, then we expect $IO(hc)_{i,t}$ to be negatively associated with the net excess comovement beta on the home market, $net\ \beta_{-i}^{HM}$, in (2). Furthermore, if the target country institutional investors induce the excess comovement of the return differentials with the target market index returns, then $IO(tc_l)_{i,t}$ should be positively related to the net excess comovement target market beta, $net\ \beta^{TM}$, in (2).

3.4 Control variables and variable construction

We introduce our market and firm level control variables that may influence the cross-sectional and time-series attributes of the excess comovement market betas in (2). In a frictionless integrated global market, a long-short arbitrage portfolio consisting of the shares of cross-listed and its equivalent home market shares should not be exposed to any risk. To the extent that impediments limit investors' abilities to conduct arbitrage between the cross-listed and its home market share, the residual market risk exposures of a long-short arbitrage position may be in part driven by the existence of such impediments. In this regard, for our control variables, we mainly focus on market and firm level impediments to arbitrage.

3.4.1 Market-level controls

{*geographical distance, time zone difference, hm transaction cost, tm transaction cost, hm market capitalization-to-GDP, tm market capitalization-to-GDP, hm investor protection, tm investor protection, hm short sale restriction, tm short sale restriction, emerging market indicator*}

The number of time zone difference that separates the home and the target market may result in non-synchronous trading arising from different closing times of daily trading sessions across markets. New information on firms is usually disseminated during local business hours, and trading based on this information is likely take place during local trading hours. For instance, Australian stocks cross-listed on US markets, US markets are closed during Australian business hours. This delays in how quickly the new information gets impounded to the prices of cross-listed shares. Furthermore, the time zone difference between the target market and its counterpart home market may also affect arbitrageurs' ability to force price parity between the cross-listed and its home market share. It would be easier for traders and market makers to arbitrage away any price differentials between the cross-listed and its home market security when trading sessions of the two markets overlap. We define *time zone difference* to be the absolute value of the time zone difference between the target and its counterpart home market. Similarly, the geographical distance between the target and its counterpart home market also captures the effects of non-synchronous trading. *Geographical distance* is the natural log of the distance (in miles) between the cities where the target and the home market is located in.

Restrictions on short sales pose a direct impediment to arbitrage [Bris, Goetzman, and Zhu (2007); Jain, Jain, Mclnish, and Mckenzie (2013)]. Bris et al. (2007) reports that short-selling is permitted only in 24 of the 47 countries they study. Short-selling, in general, is more restrictive in non-US markets. In addition, Bris et al. (2007) finds that individual stock returns are more negatively skewed in markets with fewer or less stringent restrictions on short-selling. Different levels in short selling restrictions between the target and its counterpart home market could result in larger return differentials between the target and its home market share. The deviations from price parity in which the share price on the market with more restrictions on short-selling is comparatively higher than the price of security that is listed on the market with less short-selling restrictions is less likely to dissipate quickly due to limits to arbitrage. We draw and update data on short sale restrictions for each target and home country from Bris et al. (2007). *Tm short sale restriction* and *hm short sale restriction* denote the degree of short sale restrictions in target and home market, respectively. *Tm short sale restriction* and *hm short sale restriction* take the value 0 if there is no restriction on short sales. We assign the value 0.5 to *tm short sale restriction* and *hm short sale restriction* if there are some restrictions on short selling. Lastly, *tm short sale restriction* and *hm short sale restriction* take the value 1 in cases where short selling is not allowed.

Direct or indirect barriers on foreign investment could impede inter-market arbitrage across different jurisdictions. Barriers on foreign investments include: (i) foreign exchange control, (ii) limits on repatriation of capital, (iii) tax withholdings on investment income earned by foreign investors, and (iv) complex approval process for foreigners to invest in a particular country. These restrictions on foreign investment could limit arbitrageurs' ability to arbitrage away any return differentials between the cross-listed and it counterpart home market share. The literature shows that one of common country level proxies which captures the aforementioned restrictions on foreign investment is the level of economic development [Edison and Warnock (2003)]. The countries with lower degree of economic development tend to have more restrictions on foreign investments.

There are several measures that capture the degree of economic development. To capture the degree of economic development for target and home countries presented in our sample, we use the ratio of country stock market capitalization to GDP. We draw country stock market capitalization data from DataStream International, and obtain GDP data from the IMF website. For country stock market capitalization data, we use the total market capitalization of DataStream country index measured in millions of US dollars. GDP is also measured in millions of US dollars. The ratio of target market capitalization to its GDP and home market capitalization to its GDP are denoted *tm market capitalization-to-GDP* and *tm market capitalization-to-GDP*, respectively. Furthermore, Edison and Warnock (2003) shows that emerging countries are likely to have more foreign investment restrictions. Using the country classification by the International Financial Corporation (IFC) of the World Bank Group, we construct an indicator variable, *emerging market indicator*, which is 1 if a country is an emerging country and 0 otherwise.

The level of investor protection and exchange trading rules in the target and its counterpart home country could influence the return differentials between the cross-listed and its home market share. Poor investor protection and exchange trading rules would pose as an indirect restriction to investments including arbitrage activities. Morck, Yeung, and Yu (2000) argues that poor investor protection from corporate insiders can make informed arbitrage unattractive, and arbitrageurs with firm-specific information may be less inclined to trade on it. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998) shows that shareholders are entitled to a different set of legal protection depending on legal jurisdiction. Thus, depending on the country of origin, the set of legal rights underpinning a cross-listed and its counterpart home market security may be different for an arbitrageur even though the claim on the cash flow underpinning each security is exactly the same. In this regard, different degree of investor protection across jurisdictions could affect inter-market arbitrage activities, which, in turn, could influence the return differentials between the cross-listed and its counterpart home market share. We use the investor protection index constructed by La Porta, Lopez-de-Silanes, and Shleifer (2006). The investor protection index is the principal component of anti-director rights, disclosure requirements, and liability standards. *Tm investor protection* and *hm investor protection* are the values of investor protection index drawn from La Porta, Lopez-de-Silanes, and Shleifer (2006) for the target and its counterpart home country, respectively. Furthermore, *Tm exchange rules* and *hm exchange rules* are the values of exchange trading rules drawn from Cumming, Johan, and Li (2011) for the target and its counterpart home country, respectively.[29]

Transaction costs could be an impediment to inter-market arbitrage. We use market-level transaction cost measures compiled by Elkins McSherry. *Tm transaction cost* and *hm transaction cost* are market-level transaction cost in basis points, which is the sum of commissions, fees, transfer taxes, and price impact of block trades, for the target and its counterpart home market, respectively. Elkins McSherry compiles these transaction cost measures quarterly. We use annual average of quarterly transaction costs for each market in our sample.

3.4.2 Firm-level controls

{*size, market capitalization, analyst coverage, hm security illiquidity, tm security illiquidity*}

[29] Cumming, Johan, and Li (2011) provides exchange trading rule scores for 45 stock exchanges around the world.

Poor firm level information environment could be an impediment to arbitrage activities. One of the main functions of arbitrage is to impound firm specific information into stock prices and bring stock prices to fundamental values. However, the existence of asymmetric information between corporate insiders and other shareholders would make engaging in any arbitrage activity unattractive. Thus, the degree of asymmetric information for a given firm could affect the return differentials between the cross-listed and its equivalent home market share. Literature has shown that larger firms and/or firms with good analyst coverage tend to have a lower degree of information asymmetry between corporate insiders and other investors. We measure firm size in terms of total asset, and *size* is the natural logarithm of firm's annual total asset value in US dollars at year-end obtained from Worldscope. *Market capitalization* of a firm is defined as the natural logarithm of the stock's annual average of daily market capitalization in US dollars drawn from DataStream International. We note that *size* and *market capitalization* may also proxy for the liquidity of firm's stock as stocks of larger firms tend to be more liquid. Furthermore, to measure the extent of *analyst coverage*, we use the number of 1-year-ahead earnings-per-share (EPS) estimates for the home market security. We use the year-end values of analyst EPS estimates compiled from International Summary data of I/B/E/S. The extent of analyst coverage may also reflect information acquisition costs for investors.

Illiquidity either in the target market for the cross-listed securities or in its counterpart home market for the ordinary securities could potentially impede arbitrage activity. In the discussion above, we considered transaction costs at the market level. Illiquidity in the cross-listed share or its ordinary home market share or both would increase the cost associated with conducting arbitrage. The degree of illiquidity is related to price impact of order flow. To estimate price impact cost for a security, we compute Amihud illiquidity measure separately for the cross-listed and its home market shares. Following Amihud (2002), we compute the annual average ratio of the daily absolute return to the dollar value of transaction on that day. *Tm security illiquidity* and *hm security illiquidity* are Amihud illiquidity measures for the cross-listed and its counterpart home market share, respectively.

3.5 Sample construction & description

In this section, we discuss the sample construction process and describe our sample of cross-listed securities. The World Federation of Exchanges (WFE) provides statistics on the number of foreign firm listings on stock exchanges around the world. In choosing target ("host") markets, we select stock exchanges that host foreign securities for each of the four regions, Africa, Americas, Asia, and Europe. This process results in 19 target stock exchanges over the period between 2001 and 2010. These 19 target markets include Johannesburg (Africa), Australia, Hong Kong, Singapore, Taiwan, Tokyo (Asia), Lima, NASDAQ, New York, Toronto (Americas), Euronext Amsterdam, Euronext Brussels, Euronext Lisbon, Euronext Paris, Frankfurt, London, Luxembourg, Oslo, and Swiss (Europe). We only consider exchange listed securities. The London Stock Exchange listings include foreign listings on Alternative Investment Market (AIM). We do not include foreign securities trading on SEAQ International as securities traded on SEAQ are not exchange listed securities. Our data on Singapore Stock Exchange includes listings on SESDAQ. The listings on the TSX Venture are a part of the Toronto market sample. Our Euronext samples include listings on Alternext markets. The New York Stock Exchange sample includes listings on AMEX. For the Frankfurt sample, we only consider foreign securities listed under prime standard, general standard, and entry standard. We ignore all foreign listings on OTC markets.

We use the stock universe compiled by DataStream International in constructing our sample of cross-listed securities. We first exclude all securities of special types, such as preferred stocks, royalty trusts, and investment funds. We also drop all company stocks domiciled in tax havens, such as British Virgin Islands and Cayman Islands. We then identify foreign securities based on the country of incorporation. To pair up each cross-listed share with its counterpart home market ordinary share, we manually match each security listed on target markets with its ordinary security listed on the home market using company name, security name, and ISIN codes. Our sample of cross-listed securities is further restricted by the availability of daily price and trading volume data provided by DataStream International. Our sample period spans from January 2001 to December 2010. The above sample construction process yields the final sample of 2,020 unique home market ordinary securities with cross-listings on at least one of the 19 target markets from 58 different home countries.

Table 3.1 shows the distribution of cross-listed shares across 19 target exchanges grouped by home region and home country's degree of economic development (developed vs. emerging). We use the classification of developed and emerging countries by International Financial Corporation (IFC) of the World Bank Group. The first coordinate in each cell in Table 3.1 represents the number of cross-listings, and the second coordinate in each cell, which is in parentheses, represents the number of cross-listed securities that have at least 60 computable daily return data associated with strictly positive trading volume in any sample year. There are a total of 2,726 cross-listed securities during the period between 2001 and 2010. The London Stock Exchange hosts the largest number of cross-listings, 717. The London Stock Exchange hosts more cross-listings than that of NASDAQ and the New York Stock Exchange combined, 696. The Euronext Lisbon is the smallest host market with only 5 cross-listed securities. In Table 1, we observe that most target markets draw a larger number of cross-listings from countries geographically close. This is consistent with the findings of Sarkissian and Schill (2004). Sarkissian and Schill (2004) finds that geographical proximity plays an important role in the choice of overseas listing venues. Furthermore, approximately 85% (2,317 out of 2,726) of cross-listings come from companies domiciled in developed countries. The majority of cross-border listings from the emerging world originates from companies domiciled in emerging Americas and emerging Asia. Companies from emerging Americas mainly cross-list their shares on the New York Stock Exchange. On the other hand, cross-listing destinations for firms domiciled in emerging Asia are more diverse; the share of Asian, American, and European target ("host") markets are about 42% (76 out of 178), 24% (42 out of 178), and 34% (60 out of 178), respectively.

In estimating the time series regression specified in (2), for each cross-listed and its home market ordinary share pair, given a sample year, we require at least 61 days of trading (with strictly positive trading volume) for both the cross-listed and its counterpart home market share to ensure that we obtain reasonably precise regression coefficients in (2). As noted above, in Table 1, the second coordinate in each cell (in parentheses) shows the number of cross-listed securities that have at least 60 computable return days associated with strictly positive trading volume in any sample year. While there are a total of 2,726 cross-listed securities during the period between

2001 and 2010, we observe only 1,666 cross-listed securities that have at least 60 computable return days in any sample year. The drop from 2,726 to 1,666 cross-listed securities represents approximately 39% reduction. This dramatic reduction is primarily driven by the fact that cross-listed securities on target markets have many days without trading.

From Table 3.1, due to inactive trading of target market securities, we observe that the European target markets lose the largest number of cross-listings applying our trading days criteria described above. After applying our requirement on trading days, the reductions in our sample from the Asian, Americas, and European target markets are approximately 27% (from 291 to 212), 15% (from 859 to 733), and 54% (from 1,576 to 721), respectively. The US target markets, NASDAQ and the New York Stock Exchange combined, lose a mere 7% (from 696 to 646) of their sample after applying our requirement on trading days. On the other hand, our sample of cross-listed securities on the London Stock Exchange, which hosts the largest number of cross-listings of 717, is reduced to 236 (67% reduction) with the requirement on trading days that we impose.

3.6 Summary statistics

3.6.1 Summary statistics of return differentials

After applying our requirement on trading days, we are left with 1,666 cross-listed- home-market-share pairs for the sample period between 2001 and 2010. In Table 3.2, we present the summary statistics of the daily return differentials between the cross-listed and its counterpart home market share adjusted for bundling ratio. The daily return differential between the cross-listed and its home market ordinary share is defined as $\ln(P_{i,t}^{TM_l}/P_{i,t-1}^{TM_l}) - \ln(P_{i,t}^{HM}/P_{i,t-1}^{HM})$. Panel

A of Table 3.2 shows time-series attributes and distribution of the daily return differentials between the cross-listed and its home market share. Panel A of Table 3.2 includes the mean of daily return differentials in the first column, the mean of absolute value on the daily return differentials in the second column, and the standard deviation of daily return differentials in the fourth column. The overall mean of the daily return differentials is only 0.8 basis points. The distribution of daily return differentials is fairly symmetric; the middle 50% of the distribution ranges from -93 to 94 basis points. This symmetry may reflect mean reverting tendency of the return differentials between the cross-listed and its counterpart home market share. The standard deviations of the return differentials are notably larger for 2008 and 2009, which coincide with the recent global financial crisis, and are 424 basis points and 351 basis points, respectively. This may be due to heightened volatility and additional liquidity constraints that limit arbitrage activities. Furthermore, Panel A of Table 3.2 reports the summary statistics of cross-listed-home-market-share pairs with completely synchronous trading hours as well as pairs with non-synchronous trading hours. The means of the daily return differentials for the pairs with synchronous and non-synchronous trading hours are similar. However, we note that the standard deviation of 325 basis points for the pairs with non-synchronous trading hours is larger compared to that of 250 basis points for the pairs with synchronous trading hours.

Panel B of Table 3.2 reports the summary statistics of the daily return differentials between the cross-listed and its counterpart home market share by target ("host") markets. We observe that the means of daily return differentials are generally positive across target markets. Among target markets that host larger number of cross-listings, the US target markets, the New York Stock Exchange and NASDAQ, have smaller return differentials on average, 8 basis points.

Furthermore, the standard deviation of daily return differentials for the New York Stock Exchange, 233 basis points, is the smallest among larger target markets. The standard deviations of daily return differentials are smaller for the European target markets compared to those of target markets located in other regions. The Asian target markets exhibit larger daily return differentials on average as well as larger standard deviation of daily return differentials.

3.6.2 Summary statistics of time series regression estimates

In Table 3.3, we report summary statistics of time series regression estimated from (2). We present distributional information on the estimated regression coefficients and associated p-values for 8,950 observations (firm-target market-year) in Panel A of Table 3. Panel B of Table 3.3 separately shows sample summary statistics and p-values for cross-listed-home-market-share pairs with synchronous trading hours (4,220 observations) and with non-synchronous trading hours (4,730 observations), respectively. The reported p-values on the mean-reversion coefficient are based on t-tests of the hypothesis that the coefficient of the mean-reversion term is equal to zero. The reported p-values on the net excess comovement market betas and the coefficients on exchange rate changes are for tests of the hypothesis that the coefficients of lagged, contemporaneous, and leading risk exposures are jointly zero. As discussed above, in (2), the dependent variable is the return measured in target market currency of a portfolio consisting one long position in the cross-listed share and short positions in an equivalent number of home market ordinary shares.

In Panel A of Table 3.3, we note that the estimated intercepts in (2) are zero on average. Furthermore, on average, we find that return differentials exhibit negative mean-reversion (=-

0.38), negative net exposure to the home market return (=-0.32), positive net exposure to the target market return (=0.33), and negative net exposure to the exchange rate change (=-0.29). Panel A of Table 3.3 shows that the most mean-reversion coefficient estimates are negative with small p-values less than 0.08. This indicates that return differences reverse within one day. The existence of mean-reversion may be evidence of significant cross-autocorrelations in the cross-listed and its counterpart home market share returns due to delayed reactions to information, which stems from non-synchronous trading, or non-synchronous trading hours. The feature of mean-reversion may also be consistent with arbitrageurs responding to deviations in return between the cross-listed and its counterpart home market share. However, as we noted earlier, we are unable to distinguish between these two cases. The distribution of net excess comovement home market betas is negatively skewed as more than 75% of the values are negative. The hypothesis that the lagged, coincident, and leading home market betas are jointly zero can be rejected in 50% of all cases at 8% significance level. Furthermore, the distribution of net excess comovement target market betas has a positive skew as over 75% of the estimated values are positive. Approximately 50% of the estimated excess comovement target market betas have p-values less than 0.09. Lastly, from Panel A of Table 3, we note that the adjusted r-squared is 0.29 on average with the interquartile range between 0.17 and 0.38, which represents rather high explanatory power of our time series regression given that the portfolios are zero net investment arbitrage positions.

In Panel B of Table 3.3, we report summary statistics separately for our samples based on the synchronicity of trading hours between the target and it counterpart home market. The means of the estimated coefficients on the mean-reversion term are similar between the cross-listed-home-market share pairs with synchronous trading hours and the pairs with non-synchronous trading hours, -0.39 and -0.36, respectively. On average, the estimated net excess comovement home market betas for the sample of the pairs with non-synchronous trading hours, -0.48, are much larger (in negative values) than those of pairs with synchronous trading hours, -0.13. Similarly, the net excess comovement target market beta estimates, 0.51, are also larger on average for the pairs with non-synchronous trading hours than those of the pairs that have synchronous trading hours, 0.14. Furthermore, by examining distributional information on the net excess comovement home market beta estimated for the pairs with synchronous trading hours, a little over 50% of the estimated coefficients are negative. In contrast, over 75% of the net excess comovement home market coefficient estimates are negative for the pairs with non-synchronous trading hours. We observe similar distributional attributes for the net excess comovement target market beta estimates across two different samples based on the synchronicity of trading hours between the target and it counterpart home market.

In Table 3.4, we present the mean values of estimated coefficients of time series regression in (2) across 19 target markets grouped by home market region and home country's degree of economic development (developed vs. emerging).[30] We do not report the means of estimated net foreign exchange betas in Table 4 to conserve space as our paper does not focus on these betas and extensive analysis of these betas is beyond the scope of this paper. We note that the mean values of the mean-reversion coefficient estimates are all negative across target markets and across home market regions. On average, the estimated coefficient on the mean-reversion term is larger in absolute value for stocks with developed home markets, -0.40, compared to stocks with

[30] We use the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group.

emerging home markets, -0.27. Thus, the returns of cross-listed-home-market-share pairs with developed home markets exhibit much stronger mean-reversion compared to the pairs with emerging home markets. Table 4 shows that the estimated net excess comovement home market betas are generally negative on average across target markets and across home market regions. The estimated net excess comovement home market betas for firms with developed home markets, -0.37, are larger in absolute value on average compared to those of firms with emerging home markets, -0.09. Furthermore, for firms with emerging home markets, on average, we observe that the estimated net excess comovement target market betas are larger than those of firms with developed home markets.

3.6.3 Summary statistics of firm-level factors

We report summary statistics of firm-level factors by target market in Table 3.5. Our sample includes 1,666 cross-listed securities between 2001 and 2010. For each target market, individual cell in Table 3.5 represents the average value of each firm-level variable. *IO(hc)* and *IO(tc)* are the percentages of market capitalization of a firm held by institutional investors domiciled in home country and in target country, respectively. The mean of *IO(hc)* is 12.1% but varies widely across target markets; *IO(hc)* ranges between 1.6% for Singapore Exchange and 34.3% for cross-listed firms on Six Swiss Exchange. The average value of *IO(tc)* is approximately 9% and is smaller than average for *IO(hc)*. However, for cross-listed firms on U.S. markets, the U.S. institutional ownership is higher than the institutional ownership of home country institutions.

We employ three variables, *size*, *market capitalization*, and *analyst coverage*, to measure firm level information environment. *Size* is the natural logarithm of total asset value (U.S. dollar in millions) of a firm, and *market capitalization* is the natural logarithm of total market capitalization (U.S. dollar in millions) of a firm. Not surprisingly, *size* and *market capitalization* are highly correlated. Six Swiss Exchange and Tokyo Stock Exchange host cross-listings of larger firms. The Asian target markets, in general, host smaller firms. The distribution of average *analyst coverage* across target markets is similar to *size* and *market capitalization*. Firms with cross-listings on European target markets have better analyst coverage on average.

Home market security illiquidity and *target market security illiquidity* are price impact measures (proposed by Amihud (2002)) of the ordinary home market security and the cross-listed security on the target market, respectively. A larger value for Amihud measure indicates that a security is more illiquid. On average, the cross-listed securities are more illiquid compared to its counterpart home market securities. Furthermore, the standard deviation of target market security illiquidity, 96.5, is much larger than that of home market security illiquidity, 16. Unexpectedly, *target market security illiquidity* for cross-listed securities on NASDAQ has a substantially larger value indicating high illiquidity. However, this large value, 12.7, on illiquidity measure for cross-listed securities on NASDAQ is primarily driven by a few extreme observations; the range from the fifth to the ninety fifth percentile is from 0.00003 to 1.68 with the median value, 0.01.

3.6.4 Summary statistics of market-level factors

In Table 3.6, we show summary statistics of market-level factors by target market. We include *geographical distance* and *time-zone difference* in our multiple regression analyses to control for the effects of non-synchronous and asynchronous trading between the target and its counterpart home market. *Geographical distance* is the natural logarithm of the distance (in miles) between the cities in which the target and its counterpart home market is located. *Time-zone difference* is the absolute value of the time-zone difference between the cities where the target and the target and its home market is located in. *Geographical distance* and *time-zone difference* are highly correlated as expected. Furthermore, we observe that the European target markets draw cross-listings from countries closer than other target markets on average.

Hm transaction cost and *tm transaction cost* are measures of market level transaction costs in respective markets, the home and the target market, compiled by Elkins McSherry. Our market level transaction cost measures are expressed in basis points, which is the sum of commissions, fees, transfer taxes, and price impact of block trades. On average, transaction cost in the target market is lower than in home markets. One notable exception is London Stock Exchange. London, which is one of the world's largest financial centers have higher transaction costs than its counterpart home markets.

To the extent that barriers to foreign investments could impede inter-market arbitrage activities, we include measures of financial development, *hm capitalization-to-GDP* and *tm capitalization-to-GDP*, to proxy for foreign investment barriers in our multiple regression analyses. These variables are constructed as ratios of total market capitalization to GDP for respective markets/countries. We observe that the means for target markets are higher than those of home markets indicating that target markets are more financially developed compared to cross-listing firms' home markets on average.

Poor investor protection would pose as an indirect restriction to investments including arbitrage activities. We use the investor protection index constructed by La Porta, Lopez-de-Silanes, and Shleifer (2006). *Tm investor protection* and *hm investor protection* are the values of investor protection index drawn from La Porta, Lopez-de-Silanes, and Shleifer (2006) for the target and its counterpart home country, respectively. On average, *tm investor protection* is higher than *hm investor protection*. However, for the European target markets, home markets provide better investor protection than in target markets.

Our variables on short sale restrictions are based on Bris, Goetzmann, and Zhu (2007). *Tm short sale restriction* and *hm short sale restriction* represent the degree of short sale restrictions in target and home market, respectively. *Tm short sale restriction* and *hm short sale restriction* take the value 0 if there is no restriction on short sales. We assign the value 0.5 to *tm short sale restriction* and *hm short sale restriction* if there are some restrictions on short selling. *Tm short sale restriction* and *hm short sale restriction* take the value 1 in cases where short selling is not allowed. The sample average for *tm short sale restriction* is lower than *hm short sale restriction*. However, in general, the degree of restrictions on short sales is similar between target and its counterpart home market.

3.7 Preliminary regression results

In this section, we test our main hypothesis via regression analysis. We have documented significant negative home market and positive target market excess comovement in the long (cross-listed share)-short (equivalent number of home market shares) position returns. Our ultimate goal is to examine the influence of global institutional investors on return differentials between the cross-listed and its counterpart home market share. Specifically, we test whether institutional investors domiciled in home country induce excess comovement in the long-short returns with the home market returns. Similarly, we examine whether institutional investors domiciled in target country contribute to excess comovement in the long-short position returns with the target market returns.

The annual panel includes 7,112 observations (firm-target market-year) for 1,164 firms with cross-listings on 19 target markets between 2001 and 2010. We estimate pooled ordinary least squares (pooled OLS) regressions with robust standard errors. In all regression specifications, standard errors are robust to heteroskedasticity. Furthermore, we cluster standard errors by firm. This allows for potential correlation among observations of the same firm across different years [Petersen (2009); Cameron, Gelbach, and Miller (2006)].[31] The dependent variables are excess comovement home market net beta and excess comovement target market net beta obtained by estimating time-series regression in (2). To control for the effects of non-synchronous trading between the cross-listed and its home market shares, we include *geographical distance* in our preliminary regressions.[32]

Table 3.7 reports preliminary regression results. The dependent variable of Model (1), (2), and (3) is excess comovement home market net beta, and the dependent variable for Model (4), (5), and (6) is excess comovement target market net beta. Model (2) and (4) include year fixed-effect. In addition to year fixed-effect, Model (3) and (6) include both home and target market fixed-

[31] Based on Petersen (2009), we do not cluster by year as our sample spans only over 10 years.
[32] We do not include *time-zone difference* in our regressions because *geographical distance* and *time-zone difference* are highly correlated. The correlation between *geographical distance* and *time-zone difference* is approximately 0.8.

effects to control for market level factors that may influence return differentials between the cross-listed and its home market share. The key variables are *IO(hc)* and *IO(tc)*. *IO(hc)* is statistically significant at 1% level in Model (1), (2), and (3). The coefficients of *IO(hc)* are negative indicating that institutional investors domiciled in home country induce excess comovement in the long-short returns with the home market returns. The inclusion of target and home market fixed effects reduces the effect of *IO(hc)* considerably, from -0.0074 to -0.0026, in Model (3). One standard deviation (20.9) increase in *IO(hc)* decreases home market net beta by 0.1 standard deviation (-0.0026*20.9/0.52).

The results on excess comovement target market net beta are weaker. In Model (1) and (2) of Table 7, *IO(tc)* is not statistically significant. *IO(tc)* becomes statistically significant once we include home and target market fixed-effects. In Model (3), the estimated coefficient on *IO(tc)* is positive, 0.0009, indicating that institutional investors contribute to excess return comovement in the arbitrage position consisting of cross-listed and its home market shares with the target market returns. One standard deviation (14.2) increase in *IO(tc)* results in 0.03 standard deviation (0.0009*14.2/0.51) increase in target market net beta. Compared to the effect of *IO(hc)*, the impact of *IO(tc)* on excess comovement is much smaller.

3.8 Main regression results

In this section, we discuss our main regression results. We test our main hypothesis controlling for known firm- and market-level factors that may influence return differentials between the cross-listed and its counterpart home market share. Our main test is based on the theory of Basak and Pavlova (2013). To remind our readers, our main hypothesis examines whether home country institutional investors is associated with excess comovement in the long (cross-listed share)-short (the equivalent number of home market shares) returns with the home market returns. In addition, we test whether institutional investors domiciled in target country contribute to excess comovement in the long-short position returns with the target market returns.

The annual panel includes 6,600 observations (firm-target market-year) for 1,107 firms with cross-listed securities on 19 target markets over the span of 2001 and 2010. We estimate pooled OLS regressions with standard errors robust to heteroskedasticity. We also cluster standard errors by firm. The dependent variables are excess comovement home market net beta and excess comovement target market net beta estimated via time-series regression in (2). In all regression specifications, we include year, home and target emerging market, home and target market region fixed-effects. We include emerging market indicator variables for home and target market to capture the potential effect of capital control, which we often observe among emerging markets. Furthermore, we report multiple regression results on our sub-samples: sample of U.S. cross-listed securities, non-U.S. cross-listed securities, cross-listed-home-market-share pairs with synchronous trading hours, the pairs with non-synchronous trading hours.

In Panel A of Table 3.8, we report regression results on all sample and sub-sample of U.S. and non-U.S. cross-listed securities. The dependent variable for Model (1), (2), and (3) is excess comovement home market net beta. Home market net betas are negative on average and, thus, the variables with a negative estimated coefficient intensify the negative excess comovements with home market. The dependent variable for Model (4), (5), and (6) is excess comovement target market net beta. Since target market betas are positive on average, the variables associated with a positive regression coefficient induce the excess return comovements with target market. Model (1) and (4) use all samples. Model (2) and (5) employ a sample of U.S. cross-listed securities, and Model (3) and (6) use a sample of non-U.S. cross-listed securities. *IO(hc)* and *IO(tc)* are the key variables of interest.

In Model (1), the estimated coefficient of *IO(hc)* is negative, -0.0037, and *IO(hc)* is statistically significant at 1% level. Thus, institutional investors domiciled in home country induce excess return comovement in the long-short position returns with the home market returns. One standard deviation (20.9) increase in *IO(hc)* results in 0.15 standard deviation (-0.0037*20.9/0.52) decrease in excess comovement home market net beta.

Among our control variables, some results are consistent with our hypothesis, but some are contrary to what we expected. The estimated coefficient on *tm security illiquidity* is negative, which shows that illiquidity in cross-listed securities on target markets impedes arbitrage and exacerbates the excess return comovements. One standard deviation (96.5) increase in tm security illiquidity is associated with 0.33 standard deviation (-0.0018*96.5/0.52) decrease in home market net beta. The economic significance of *tm security illiquidity* is more than twice as large as that of *IO(hc)*. Furthermore, we note that the sign of the coefficient on *size* is negative indicating that the excess negative comovement with the home market returns increases with the size of firm. Larger firms are better known to investors and that there is less information asymmetry. In addition, larger firm stocks tend to be more liquidity. In this regard, we would expect that price differences between the cross-listed and its counterpart home market share are more easily arbitraged away and, thus, return differentials between the two shares, the cross-listed and its counterpart home market share, are small. However, this is not we find from our regression results. Furthermore, to the contrary to our hypothesis, we find better investor protection in target market is associated with more intense excess negative comovement. After controlling for other factors, short sale restrictions in target and home market are not important explanatory variables.

We report sub-sample results on U.S. cross-listed stocks and non-U.S. cross-listed stocks in Model (2) and (3), respectively. In Model (2), for U.S. cross-listed firms, we find that the estimated coefficient on *IO(hc)* is positive, 0.0022, indicating higher home country institutional ownership reduces the excess negative comovement in the long-short position returns with the home market returns. One standard deviation (12.5) increase in *IO(hc)* is associated with 0.07 standard deviation (0.0022*12.5/0.38) increase in home market net beta. On the other hand, in the sub-sample results on a sample of non-U.S. cross-listed firms in Model (3), *IO(hc)* has a negative estimated regression coefficient, -0.0031. Thus, for non-U.S. cross-listed firms, higher institutional ownership by institutions domicile in the home country intensifies the excess negative comovement with the home market returns, which is what we find on our overall sample. One standard deviation (26.3) increase in *IO(hc)* decreases home market net beta by 0.13 standard deviation (-0.0031*26.3/0.64). The absolute economic effect of *IO(hc)* is much larger for cross-listed stocks on non-U.S. target markets compared to those on U.S. target markets.

In Panel A, Table 3.8, Model (4), (5), and (6) shows regression estimates on excess comovement target market net beta. In all models, Model (4), (5), and (6), we find that the estimated coefficients of *IO(tc)* are positive, but *IO(tc)* is not statistically significant. Thus, institutional investors domiciled in target countries do not exert significant influence on the excess comovement in the long-short position returns with the target market returns. This result may be because the trading patterns and demand for cross-listed securities are different from those of local stocks, and that, generally, target country institutional investors do not trade cross-listed stocks in coordination with other local stock holdings.

Furthermore, in general, we expect the influence of other control variables on net target market betas to be of opposite sign to the home market betas. Illiquidity in ordinary home market shares exacerbate the excess comovement in returns with the target markets as the estimated coefficient on *hm security illiquidity* is positive but significant only at 10% level. However, in Model (4), the influence of *tm short sale restriction* is different compared to Model (1). In Model (4), unexpectedly, the restrictions on short sales in target market reduce the intensity of excess comovement with the target market returns. Furthermore, higher transaction cost in target market is associated with lower excess comovement.

Model (5) shows the regression estimates on a sample of U.S. cross-listed stocks. We note that the adjusted r-squared of Model 5 is 0.5, which is the largest among Model (1)-(6). One notable result is that the estimated coefficient of *geographical distance* is negative. As the geographical distance between the target and its counterpart home market increases, the excess positive comovement in the long-short pair returns with the target market returns decreases. However, we would expect the opposite as the distance between the target and the home market poses as an impediment to arbitrage activity. The inclusion of target and home market region fixed-effects may be adding to the complexity in the effects of *geographical distance*. In Model (5), we note that the restriction on short sales in home market intensifies the excess comovement with the target market returns. Model (6) is estimated using a sample of non-U.S. cross-listed stocks. For cross-listed securities on non-U.S. target markets, better investor protection in home market reduces the excess positive comovement. Furthermore, we note that our regression models explain a substantial fraction of the cross-sectional and time series variation in the estimated net home and target market betas: the adjusted r-squared for our models range from 0.15 to 0.49 in Model (1) through Model (6).

To separate out the effects of non-synchronous trading due to trading hour difference between target and it counterpart home market, we split our sample into two: cross-listed-home-market-share pairs with synchronous trading hours and the pairs with non-synchronous trading hours. In Panel B of Table 3.8, Model (7) and (8) show regression estimates on excess comovement home market net beta, and the dependent variable for Model (9) and (10) is excess comovement target market net beta. The sample for Model (7) and (9) is the cross-listed-home-market-share pairs with synchronous trading hours. Model (8) and (10) are estimated using a sample of the pairs with non-synchronous trading hours.

Our key variables are *IO(hc)* and *IO(tc)*. In Model (7), for the pairs with synchronous trading hours, the estimated coefficient of *IO(hc)* negative, -0.0012, indicating that the presence of institutional investors in home country increases the excess negative comovement in the long-short pair returns with the home market returns. On standard deviation (14.8) increase in *IO(hc)* results in 0.05 standard deviation (-0.0012*14.8/0.39) decrease in home market net beta. In Model (7), we note that *IO(hc)* is statistically significant at 5% level. Furthermore, for the pairs with non-synchronous trading hours between the target and the counterpart home market, the estimated regression coefficient on *IO(hc)* is negative, -0.0035, and statistically significant at the 1% level. On standard deviation (24.6) increase in *IO(hc)* decreases home market net beta by 0.15 standard deviation (-0.0035*24.6/0.57). The economic significance of *IO(hc)* in Model (7) is only one third of the effect in Model (8). However, we note that a direct comparison of these economic significance may be difficult as the estimated excess comovement home market net beta may be affected by non-synchronous trading.

In Model (4), (5), and (6), *IO(tc)* did not appear to be an important explanatory variable for target market risk exposures, and did not play a role in understanding excess comovements with the target market returns. In Model (9), for the cross-listed-home-market-share pairs with synchronous trading hours, the estimated coefficient of *IO(tc)* positive, 0.001, indicating that the presence of institutional investors domiciled in target country intensifies the excess positive comovement in the long-short pair returns with the target market returns. One standard deviation (16.5) increase in *IO(tc)* increases target market net beta by 0.04 standard deviation (0.001*16.5/0.38). Thus, the economic significance of *IO(tc)* is small. On the other hand, for the pairs with non-synchronous trading hours, in Model (10), we find that institutional investors in target country do not exert significant influence on excess return comovements as *IO(tc)* is not statistically significant in Model (10).

In summary, we find that institutional investors induce excess comovement in returns. In overall sample, the higher the institutional ownership by home country institutions, the more intense the excess negative comovements in the long (one cross-listed share)-short (the equivalent number of home market shares) position returns with the home market returns. However, for a sample of U.S. cross-listed securities, institutional investors domiciled in home country reduce the intensity of excess comovement in the long-short position returns with the home market returns. Our results on target market net betas are weaker. Our regression analysis on overall sample indicates that *IO(tc)* is not a significant explanatory variable for target market risk exposures. However, for the cross-listed-home-market-share pairs with synchronous trading hours between the target and its counterpart home market, we find that institutional investors domiciled in target country exacerbate the excess positive comovement in the long-short position returns with the target market returns.

3.9 Robustness test

Our sample consists of stocks traded in different markets around the world. In many cases, trading hours between target and it counterpart home market are not synchronous. As intraday security prices are typically not available for non-U.S. markets, we used daily return series computed from closing prices in estimating (2). Non-synchronous trading that stems from either non-synchronized trading hours or infrequent trading can induce spurious cross-autocorrelations in cross-listed and home market share returns, and would artificially result in a mean-reverting structure in the return differentials between the cross-listed and its home market security in estimating (2). To control for this effect, we included the mean-reversion term in (2).

One way to control for the effects of non-synchronous trading between the cross-listed and its home market shares is to use security returns measured over longer period. For our robustness test, we increase return measurement horizon to 1 week from daily. Furthermore, by using security returns measured over longer period (1 week returns), we can observe the extent to which the return differentials between the cross-listed and its counterpart home market share, their mean-reversion tendency, and excess comovement in returns are transitory.

We measure weekly returns from Wednesday to Wednesday to reduce any potential noise from Monday or Friday effects. Using weekly returns, we re-estimate time-series regressions specified in (2) without the lead and lag terms on returns to obtain weekly beta estimates. Given a sample year and for each cross-listed-home-market-share pair, we require 12 weekly return observations in estimating (2). In Table 9, we report summary statistics of estimated regression coefficients obtained by estimating (2) using weekly return series. In comparison with Table 3.3, surprisingly, we observe that the distribution of mean-reversion coefficients estimated using weekly returns is similar the distribution of mean-reversion coefficients estimated using daily return series. Clearly, by examining the mean values in Table 3.9, we note that the absolute size of the estimated coefficients using weekly returns on target market and home market returns are smaller than those estimated using daily return data. This suggests that excess comovement in the long (a cross-listed share)-short (the equivalent number of home market shares) pair returns with the target and its counterpart home market index returns is transitory to some degree.

Furthermore, we re-estimate our panel regressions to examine the sources of excess comovement in the long-short pair returns with the respective market index returns. Our panel regression results are reported in Table 3.10. The annual panel includes 6,640 observations (firm-target market-year) for 1,113 firms with cross-listed securities on 19 target markets over the span of 2001 and 2010. We estimate pooled OLS regressions. Furthermore, we cluster standard errors by firm. In Table 10, the dependent variables are excess comovement home market net beta and excess comovement target market net beta for Model (1) and (2), respectively. For Model (1) and (2) in Table 9, we include year, home and target emerging market, home and target market region fixed-effects. We also include emerging market indicator variables for home and target markets to capture the potential effect of capital control and foreign investment restrictions.

From Model (1) in Table 3.10, we find that the estimated coefficient on *IO(hc)* is negative, -0.0014, and statistically significant at the 1% level. This indicates that an increase in institutional ownership by home country institutions (*IO(hc)*) intensifies excess comovement in the long-short pair returns with the home market returns. One standard deviation (20.9) increase in *IO(hc)* results in 0.06 standard deviation (-0.0014*20.9/0.5) decrease in home market beta. It is not surprising to find that the economic significance of *IO(hc)* is only one third in magnitude compared to its influence on home market net beta estimated using daily returns. In Model (2), *IO(tc)* has a positive estimated regression coefficient, 0.0007, which indicates that an increase in *IO(tc)* exacerbates excess comovement in the long-short pair returns with the target market index returns. However, *IO(tc)* is statistically significant only at the 10% level. One standard deviation (14.2) increase in *IO(tc)* is associated with 0.02 standard deviation (0.0007*14.2/0.52) increase in target market beta. Thus, *IO(tc)* has negligible economic impact on excess comovement. Furthermore, the adjusted r-squared for Model (1) and (2) in Table 9 are much smaller compared to those from the regressions that use excess comovement market beta estimates based on daily returns.

3.10 Conclusion

In an integrated global stock market, arbitrage should ensure that the return deviations between the cross-listed (target market) security and its counterpart home market security is zero. If the arbitrage is perfect, the return differential between the cross-listed and its counterpart home market share is zero, and the return differential is not exposed to any risks. However, a number of studies uncovered systematic components related to market returns and exchange rate changes in the returns of arbitrage portfolios consist of a long position in a cross-listed share and short positions in its ordinary home market shares.

In this paper, using 1,666 cross-listed securities on 19 target markets from 60 different home markets around the world, we document that the return differential between the cross-listed and its counterpart home market share is small, 0.8 basis points, on average. However, we find that the return differentials between the cross-listed and its ordinary home market share, though small, exhibit excess comovements relative to market index returns, the home and the target market returns. These particular phenomena on excess return comovements are first studied with a small sample of dual-listed companies by Froot and Dabora (1999). De Jong, Rosenthal, and van Dijk (2009) examines a complete set of dual-listed companies around the world. More recently, Gagnon and Karolyi (2010) uncovers excess comovement in returns for U.S. cross-listed stocks. We show that excess comovement in stock returns are not limited to a sample of U.S. cross-listed stocks but, in fact, pervasive among a large number of cross-listed-home-market-share pairs trading around the world.

In examining sources of excess comovement in the long (a cross-listed share)-short (the equivalent number of counterpart home market shares) pair returns with respective market index returns, we test our hypothesis based on the theories put forth by Basak and Pavlova (2013). Specifically, we test whether coordinated trading by institutional investors domiciled in home country induces to the excess comovement of the return differentials between the cross-listed and its counterpart home market share with the fluctuations of home market index. With parallel to this, we also examine whether the target country institutional investors induce the excess comovement of the return differentials with the target market index returns.

We find that, in general, institutional investors domiciled in home country intensify the excess comovement in the long-short position returns with the home market returns. For U.S. cross-listed securities, however, stronger presence of home country institutional investors reduces the intensity of excess comovement in the long-short position returns with the home market returns. Our results on target market net betas are weaker. Our findings indicate that target country institutional investors do not exert significant influence on the return dynamics of the long-short position. However, for the cross-listed-home-market-share pairs with synchronous trading hours between the target and its counterpart home market, we find that institutional investors domiciled in target country exacerbate the excess comovement in the long-short position returns with the target market returns.

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Table 3.1:
This table reports the distribution of cross-listings (secondary listings) across 19 target ("host") exchanges grouped by home market region and home country's degree of economic development (developed vs. emerging). We use the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group. Our sample period spans from January 2001 to December 2010. The first coordinate in each cell in the table represents the number of cross-listings, and the second coordinate in each cell, which is in parenthesis, represents the number of cross-listed securities that have at least 60 computable daily return data associated with strictly positive trading volume in any sample year. There are a total of 2,726 cross-listed securities during the period between 2001 and 2010. Furthermore, there are 1,666 cross-listed securities that have at least 60 computable daily return data in any sample year.

Number of cross-listed securities by target market and home market region

		home market region																			
	target market	Developed Americas		Developed Asia		Developed Europe		Developed Middle East		Emerging Africa		Emerging Americas		Emerging Asia		Emerging Europe		Emerging Middle East		total	
Asia	Australia	35	(25)	37	(24)	26	(22)	.	.	2	(2)	.	.	1	.	.	.	.	.	101	(73)
	Hong Kong	10	(5)	11	(5)	4	(3)	.	.	.	.	2	.	68	(64)	.	.	.	.	95	(77)
	Singapore	.	.	20	(14)	4	(2)	.	.	.	.	.	.	5	(4)	.	.	.	.	29	(20)
	Taiwan	.	.	22	(16)	.	.	.	.	1	(1)	.	.	.	.	.	.	.	.	23	(17)
	Tokyo	16	(11)	3	(3)	22	(9)	.	.	.	.	.	.	2	(2)	.	.	.	.	43	(25)
America	Lima	37	(13)	.	.	5	(2)	.	.	.	.	.	.	.	.	.	.	.	.	42	(15)
	NASDAQ	76	(68)	12	(11)	58	(46)	36	(36)	2	(2)	7	(7)	3	(3)	1	(1)	.	.	195	(174)
	New York	201	(189)	20	(18)	120	(116)	4	(4)	6	(5)	107	(98)	39	(38)	3	(3)	1	(1)	501	(472)
	Toronto	58	(39)	37	(20)	24	(13)	.	.	1	.	1	.	.	.	.	.	.	.	121	(72)
Europe & Africa	Euronext Amsterdam	44	(7)	.	.	65	(34)	.	.	.	.	.	.	1	(1)	.	.	.	.	110	(42)
	Euronext Brussels	10	(9)	.	.	41	(32)	1	(1)	2	(1)	.	.	.	.	.	.	.	.	54	(43)
	Euronext Lisbon	.	.	.	.	5	(3)	.	.	.	.	.	.	.	.	.	.	.	.	5	(3)
	Euronext Paris	39	(29)	2	(1)	110	(68)	.	.	6	(4)	1	(1)	.	.	.	.	.	.	158	(103)
	Frankfurt	85	(55)	12	(4)	101	(58)	1	(1)	3	(1)	4	.	3	(1)	22	(3)	2	(1)	233	(124)
	London	228	(66)	60	(40)	354	(100)	6	(1)	10	(4)	.	.	28	(6)	27	(19)	4	.	717	(236)
	Luxembourg	.	.	.	.	19	(2)	.	.	1	.	3	.	28	(1)	3	.	1	.	55	(3)
	Oslo	19	(9)	.	.	11	(10)	.	.	.	.	.	.	.	.	.	.	.	.	30	(19)
	Swiss	84	(61)	2	(2)	77	(56)	.	.	3	(1)	1	.	.	.	.	.	.	.	167	(120)
	Johannesburg	10	(6)	4	(3)	29	(19)	.	.	4	.	.	.	.	.	.	.	.	.	47	(28)
Total		952	(592)	242	(161)	1,075	(595)	48	(43)	41	(21)	126	(106)	178	(120)	56	(26)	8	(2)	2,726	(1,666)

Table 3.2: Panel A

Table 3.2 Panel A reports summary statistics of return differences for a sample of 1,666 target ("host") market cross-listed and the counterpart home market ordinary share pairs from January 2001 to December 2010. The table shows summary statistics based on all sample, a sub-sample of cross-listed-home-market-share pairs with synchronous trading hours, and cross-listed pairs with non-synchronous trading hours. We only include cross-listed security pairs with at least 60 computable daily return data associated with strictly positive trading volume in any sample year. Each pair consists of a long position in one target market cross-listed share and a short position in an equivalent (adjusted for bundling ratio) number of shares in the counterpart home market security. All return data are generated using daily closing prices in target market currency from DataStream International. $r_{i,t}^{TM_l-HM}$ denotes the return difference between the cross-listed security on the target market and its counterpart home market security on day t.[33] Number of trading days is the average number of days with computable daily return data in a given year for each cross-listed-home-market-share pairs. Table 3.2 Panel B shows summary statistics of return difference by target market.

Panel A: Summary statistics of return difference

	year	$r_{i,t}^{TM_l-HM}$	$\lvert r_{i,t}^{TM_l-HM} \rvert$	number of trading days	standard deviation	1st percentile	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	99th percentile
	2001	0.032	2.02	183.1	3.35	-9.61	-2.99	-1.17	0.01	1.21	3.04	10.00
	2002	0.020	1.95	191.8	3.20	-9.08	-2.92	-1.17	0.00	1.18	2.95	9.27
	2003	0.026	1.59	195.8	2.68	-7.33	-2.35	-0.93	0.01	0.96	2.40	7.59
	2004	0.003	1.33	199.3	2.28	-6.55	-1.94	-0.77	0.00	0.78	1.95	6.50
All	2005	0.005	1.23	196.8	2.10	-6.16	-1.80	-0.69	0.00	0.70	1.80	6.18
sample	2006	-0.002	1.29	195.2	2.22	-6.67	-1.91	-0.71	0.00	0.71	1.91	6.61
	2007	-0.015	1.47	192.4	2.51	-7.43	-2.23	-0.81	-0.01	0.78	2.17	7.50
	2008	0.013	2.52	193.1	4.24	-12.54	-3.80	-1.38	0.00	1.38	3.80	12.88
	2009	-0.002	2.12	201.3	3.51	-10.30	-3.16	-1.25	0.00	1.24	3.14	10.29
	2010	0.008	1.49	207.1	2.49	-7.24	-2.18	-0.85	0.00	0.88	2.25	7.23
	overall	0.008	1.69	195.6	2.92	-8.51	-2.49	-0.93	0.00	0.94	2.49	8.67
Synchronous trading hours		0.009	1.41	199.4	2.50	-7.40	-2.05	-0.73	0.00	0.74	2.06	7.52
Non-synchronous trading hours		0.008	1.95	192.1	3.25	-9.40	-2.86	-1.15	0.00	1.15	2.86	9.59

[33] $r_{i,t}^{TM_l-HM} = [\ln(P_{i,t}^{TM_l}/P_{i,t-1}^{TM_l}) - \ln(P_{i,t}^{HM}/P_{i,t-1}^{HM})] \times 100$

Table 3.2: Panel B

Table 3.2 Panel B reports summary statistics of return differences by target market for a sample of 1,666 target ("host") market cross-listed and the counterpart home market ordinary share pairs from January 2001 to December 2010. We only include cross-listed security pairs with at least 60 computable daily return data associated with strictly positive trading volume in any sample year. Each pair consists of a long position in one target market cross-listed share and a short position in an equivalent (adjusted for bundling ratio) number of shares in the counterpart home market security. All return data are generated using daily closing prices in target market currency from DataStream International. $r_{i,t}^{TM_l-HM}$ denotes the return difference between the cross-listed security on the target market and its counterpart home market security on day t.[34] Number of trading days is the average number of days with computable daily return data in a given year for each cross-listed-home-market-share pairs.

Panel B: Summary statistics of return difference: by target market

	target market	$r_{i,t}^{TM_l-HM}$	$\lvert r_{i,t}^{TM_l-HM}\rvert$	number of trading days	standard deviation	1st percentile	10th percentile	25th percentile	50th percentile	75th percentile	90th percentile	99th percentile
Asia	Australia	0.036	2.32	180.5	3.74	-10.97	-3.43	-1.36	0.01	1.43	3.48	11.18
	Hong Kong	0.039	2.61	200.3	3.61	-9.21	-4.04	-1.94	0.00	1.93	4.12	10.01
	Singapore	0.040	3.04	152.4	5.07	-16.05	-4.45	-1.77	0.00	1.77	4.53	16.80
	Taiwan	-0.015	2.85	174.5	4.13	-11.61	-4.59	-1.97	-0.01	1.98	4.60	10.48
	Tokyo	0.080	3.07	126.1	4.93	-14.89	-4.45	-1.80	0.10	1.98	4.49	14.84
America	Lima	-0.022	1.68	181.8	3.03	-9.73	-2.39	-0.82	0.01	0.82	2.36	9.04
	NASDAQ	0.008	1.88	198.4	3.12	-9.12	-2.80	-1.10	0.00	1.09	2.81	9.36
	New York	0.008	1.31	214.3	2.33	-6.58	-1.87	-0.74	0.00	0.73	1.88	6.75
	Toronto	0.014	2.48	165.1	4.27	-12.33	-3.83	-1.30	-0.01	1.26	3.71	13.47
Europe & Africa	Euronext Amsterdam	-0.002	1.55	182.6	2.70	-8.38	-2.41	-0.76	0.00	0.79	2.35	8.50
	Euronext Brussels	0.014	1.48	179.9	2.39	-6.84	-2.24	-0.89	0.00	0.92	2.28	6.89
	Euronext Lisbon	0.013	0.72	233.2	1.15	-3.17	-1.10	-0.44	0.01	0.48	1.08	3.26
	Euronext Paris	0.009	1.61	201.4	2.67	-7.83	-2.41	-0.93	0.00	0.94	2.42	8.04
	Frankfurt	0.001	1.86	180.5	3.00	-8.86	-2.83	-1.11	0.00	1.11	2.82	8.91
	London	-0.018	2.03	167.8	3.64	-11.30	-3.01	-1.01	0.00	1.03	3.00	10.67
	Luxembourg	0.024	1.43	205.4	2.18	-6.94	-2.22	-0.88	0.00	0.99	2.21	6.78
	Oslo	-0.026	2.53	195.9	4.11	-13.00	-3.72	-1.53	0.00	1.55	3.70	11.72
	Swiss	0.014	1.54	176.4	2.46	-6.94	-2.27	-0.95	0.02	0.99	2.32	6.87
	Johannesburg	-0.018	1.76	211.6	3.19	-9.70	-2.46	-0.93	0.00	0.91	2.44	9.46

[34] $r_{i,t}^{TM_l-HM} = [\ln(P_{i,t}^{TM_l}/P_{i,t-1}^{TM_l}) - \ln(P_{i,t}^{HM}/P_{i,t-1}^{HM})] \times 100$

Table 3.3: Panel A, Panel B

Table 3.3 Panel A reports summary statistics of time series regression estimated using (2). We present distributional information on the estimated regression coefficients and associated p-values for 8,950 observations (firm-target market-year) in Panel A of Table 3.3.Using daily return data, given a sample year, for each cross-listed security on target market *l* of firm *i*, we estimate,

$$r_{i,t}^{TM_l-HM} = \alpha_{i,l_{-i}} + \beta_{i,l_{-i}}^{MR} r_{i,t-1}^{TM_l-HM} + \sum_{j=-1}^{j=+1}\beta_{j_{-i}}^{TM_l} r_{t+j}^{TM_l} + \sum_{j=-1}^{j=+1}\beta_{j_{-i}}^{HM} r_{t+j_{-i}}^{HM} + \sum_{j=-1}^{j=+1}\beta_{j_{-i}}^{FX} r_{t+j}^{FX} + \varepsilon_{i,l,t} - (2)$$

where $r_{i,t}^{TM_l-HM}$ is the daily return difference between the target market security and its counterpart home market security based on target country currency denomination, $r_{t+j}^{TM_l}$ indicates the target market index daily return (in terms of target country currency), $r_{t+j_{-i}}^{HM}$ is the home market index return (in terms of home market currency), and r_{t+j}^{FX} is the currency return for the home country of firm *i* relative to the target country currency.[35] We only include cross-listed-home-market-share pairs with at least 60 computable daily return data associated with strictly positive trading volume in any sample year. Each pair consists of a long position in one cross-listed share and a short position in the equivalent (adjusted for bundling ratio) number of shares in the counterpart home market security. In (2), if the closing time of the target market is earlier than the home market, then $\beta_{-1_{-i}}^{HM}$=0 and $\beta_{+1_{-i}}^{TM_l}$=0. We impose the restriction, $\beta_{+1_{-i}}^{HM}$=0 and $\beta_{-1_{-i}}^{TM_l}$=0, in (2) for the cases where the target market's closing time is later than that of the home market. When the closing time of the target and the home market is synchronized, we set $\beta_{-1_{-i}}^{HM}= \beta_{+1_{-i}}^{HM}= \beta_{-1_{-i}}^{TM_l}= \beta_{+1_{-i}}^{TM_l}$=0 in (2). We drop all terms on currency returns in (2) when the target and the home country have the same currency. The daily return series are computed using closing prices in estimating (2). We draw daily data from DataStream International. The reported p-values on the mean-reversion coefficient are based on t-tests of the hypothesis that the coefficient of the mean-reversion term is equal to zero. The reported p-values on the net excess comovement market betas and the coefficients on exchange rate changes are for tests of the hypothesis that the coefficients of lagged, contemporaneous, and leading risk exposures are jointly zero. Panel B of Table 3.3 separately shows sample summary statistics and p-values for cross-listed-home-market-share pairs with synchronous trading hours (4,220 observations) and with non-synchronous trading hours (4,730 observations), respectively.

Panel A

Estimated betas and p-values

		mean reversion		hm net beta		tm net beta		fx net beta		
N = 8,950	intercept	coeffcient	p-value	coeffcient	p-value	coeffcient	p-value	coeffcient	p-value	adj. r-squared
mean	0.000	-0.38	0.04	-0.32	0.24	0.33	0.25	-0.29	0.29	0.29
standard deviation	0.002	0.14	0.15	0.52	0.30	0.51	0.30	40.99	0.30	0.18
10th percentile	-0.001	-0.52	0.00	-0.94	0.00	-0.14	0.00	-1.18	0.00	0.09
25th percentile	0.000	-0.47	0.00	-0.57	0.00	0.05	0.00	-0.48	0.01	0.17
50th percentile	0.000	-0.40	0.00	-0.24	0.08	0.26	0.09	-0.06	0.18	0.27
75th percentile	0.000	-0.32	0.00	-0.03	0.44	0.59	0.45	0.23	0.52	0.38
90th percentile	0.001	-0.18	0.08	0.17	0.75	0.95	0.76	0.94	0.79	0.55

Panel B

Estimated betas by trading hours

	Synchronous trading hours, N = 4,220					Non-synchronous trading hours, N = 4,730				
	mean reversion	hm net beta	tm net beta	fx net beta	adj. r-squared	mean reversion	hm net beta	tm net beta	fx net beta	adj. r-squared
mean	-0.39	-0.13	0.14	-0.43	0.25	-0.36	-0.48	0.51	-0.16	0.33
standard deviation	0.16	0.39	0.38	56.74	0.13	0.12	0.57	0.56	17.53	0.20
10th percentile	-0.54	-0.53	-0.20	-1.29	0.08	-0.50	-1.13	-0.06	-1.14	0.09
25th percentile	-0.49	-0.29	-0.02	-0.25	0.17	-0.44	-0.76	0.19	-0.60	0.18
50th percentile	-0.44	-0.11	0.12	0.00	0.25	-0.38	-0.45	0.48	-0.22	0.30
75th percentile	-0.35	0.02	0.30	0.26	0.32	-0.30	-0.15	0.80	0.19	0.46
90th percentile	-0.13	0.24	0.53	1.15	0.40	-0.20	0.09	1.15	0.84	0.62

[35] $r_{i,t}^{TM_l-HM} = [\ln(P_{i,t}^{TM_l}/P_{i,t-1}^{TM_l}) - \ln(P_{i,t}^{HM}/P_{i,t-1}^{HM})] \times 100$

Table 3.4

Table 3.4 presents the mean values of estimated coefficients of time series regression in (2) across 19 target markets grouped by home market region and home country's degree of economic development (developed vs. emerging).[36] Using daily return data, given a sample year, for each cross-listed security on target market *l* of firm *i*, we estimate,

$$r_{i,t}^{TM_l-HM} = \alpha_{i,l_{-i}} + \beta_{i,l_{-i}}^{MR}\, r_{i,t-1}^{TM_l-HM} + \sum_{j=-1}^{j=+1}\beta_{j_{-i}}^{TM_l} r_{t+j}^{TM_l} + \sum_{j=-1}^{j=+1}\beta_{j_{-i}}^{HM} r_{t+j_{-i}}^{HM} + \sum_{j=-1}^{j=+1}\beta_{j_{-i}}^{FX} r_{t+j}^{FX} + \varepsilon_{i,l,t} \quad (2)$$

where $r_{i,t}^{TM_l-HM}$ is the daily return difference between the target market security and its counterpart home market security based on target country currency denomination, $r_{t+j}^{TM_l}$ indicates the target market index daily return (in terms of target country currency), $r_{t+j_{-i}}^{HM}$ is the home market index return (in terms of home market currency), and r_{t+j}^{FX} is the currency return for the home country of firm *i* relative to the target country currency.[37] We only include cross-listed-home-market-share pairs with at least 60 computable daily return data associated with strictly positive trading volume in any sample year. Each pair consists of a long position in one cross-listed share and a short position in the equivalent (adjusted for bundling ratio) number of shares in the counterpart home market security. In (2), if the closing time of the target market is earlier than the home market, then $\beta_{-1_{-i}}^{HM}$=0 and $\beta_{+1_{-i}}^{TM_l}$=0. We impose the restriction, $\beta_{+1_{-i}}^{HM}$=0 and $\beta_{-1_{-i}}^{TM_l}$=0, in (2) for the cases where the target market's closing time is later than that of the home market. When the closing time of the target and the home market is synchronized, we set $\beta_{-1_{-i}}^{HM} = \beta_{+1_{-i}}^{HM} = \beta_{-1_{-i}}^{TM_l} = \beta_{+1_{-i}}^{TM_l}$=0 in (2). We drop all terms on currency returns in (2) when the target and the home country have the same currency. The daily return series are computed using closing prices in estimating (2). We draw daily data from DataStream International.

Estimated betas by target market and home market region

			Developed Home Market				Emerging Home Market					
	target market		Developed Americas	Developed Asia	Developed Europe	Developed Middle East	Emerging Africa	Emerging Americas	Emerging Asia	Emerging Europe	Emerging Middle East	total mean
Asia	Australia	mean reversion	-0.32	-0.39	-0.26	.	-0.35	.	.	.	.	-0.34
		hm net beta	-0.85	-0.19	-0.38	.	-0.86	.	.	.	.	-0.46
		tm net beta	0.59	0.15	0.18	.	0.54	.	.	.	.	0.30
	Hong Kong	mean reversion	-0.35	-0.33	-0.34	.	.	.	-0.05	.	.	-0.08
		hm net beta	-1.19	-0.45	-0.92	.	.	.	0.16	.	.	0.06
		tm net beta	0.50	0.28	0.60	.	.	.	0.43	.	.	0.44
	Singapore	mean reversion	.	-0.29	-0.18	.	.	.	-0.14	.	.	-0.24
		hm net beta	.	-0.20	0.01	.	.	.	-0.22	.	.	-0.19
		tm net beta	.	0.24	0.48	.	.	.	0.68	.	.	0.38
	Taiwan	mean reversion	.	-0.11	.	.	-0.01	.	.	.	.	-0.10
		hm net beta	.	-0.44	.	.	0.05	.	.	.	.	-0.37
		tm net beta	.	0.39	.	.	0.11	.	.	.	.	0.35
	Tokyo	mean reversion	-0.36	-0.32	-0.34	.	.	.	-0.27	.	.	-0.34
		hm net beta	-1.02	-0.93	-1.02	.	.	.	-0.43	.	.	-0.97
		tm net beta	0.58	0.29	0.40	.	.	.	0.22	.	.	0.44
America	Lima	mean reversion	-0.41	.	-0.37	.	.	.	.	.	.	-0.40
		hm net beta	-0.17	.	-0.18	.	.	.	.	.	.	-0.17
		tm net beta	0.01	.	0.29	.	.	.	.	.	.	0.07
	NASDAQ	mean reversion	-0.46	-0.33	-0.36	-0.37	-0.38	-0.39	-0.26	-0.38	.	-0.40
		hm net beta	-0.05	-0.34	-0.50	-0.48	-0.35	0.00	-0.53	-0.49	.	-0.29
		tm net beta	0.07	0.51	0.61	0.48	0.38	0.22	1.22	0.74	.	0.36
	New York	mean reversion	-0.45	-0.37	-0.38	-0.32	-0.40	-0.37	-0.24	-0.34	-0.33	-0.39
		hm net beta	-0.09	-0.56	-0.53	-0.25	-0.57	-0.07	-0.22	-0.27	-0.45	-0.24
		tm net beta	0.12	0.74	0.63	0.15	0.55	0.19	0.93	0.88	0.84	0.38
	Toronto	mean reversion	-0.43	-0.29	-0.29	.	.	.	.	.	.	-0.38
		hm net beta	-0.15	-0.64	-0.09	.	.	.	.	.	.	-0.26
		tm net beta	0.01	0.94	0.27	.	.	.	.	.	.	0.27

[36] We use the list of developed and emerging countries from International Financial Corporation (IFC) of the World Bank Group.

[37] $r_{i,t}^{TM_l-HM} = [\ln(P_{i,t}^{TM_l}/P_{i,t-1}^{TM_l}) - \ln(P_{i,t}^{HM}/P_{i,t-1}^{HM})] \times 100$

Table 3.4 (cont'd)

Estimated betas by target market and home market region (cont'd)

	target market		Developed Home Market				Emerging Home Market					mean
			Developed Americas	Developed Asia	Developed Europe	Developed Middle East	Emerging Africa	Emerging Americas	Emerging Asia	Emerging Europe	Emerging Middle East	
Europe & Africa	Euronext Amsterdam	mean reversion	-0.37	.	-0.42	.	.	.	-0.06	.	.	-0.42
		hm net beta	-0.84	.	-0.18	.	.	.	-0.41	.	.	-0.24
		tm net beta	0.52	.	0.08	.	.	.	0.62	.	.	0.13
	Euronext Brussels	mean reversion	-0.39	.	-0.44	-0.07	-0.42	.	.	.	.	-0.42
		hm net beta	-0.54	.	-0.25	1.27	-0.24	.	.	.	.	-0.30
		tm net beta	0.45	.	0.11	0.02	0.06	.	.	.	.	0.18
	Euronext Lisbon	mean reversion	.	.	-0.44	.	.	.	.	.	.	-0.44
		hm net beta	.	.	-0.13	.	.	.	.	.	.	-0.13
		tm net beta	.	.	0.08	.	.	.	.	.	.	0.08
	Euronext Paris	mean reversion	-0.41	-0.17	-0.42	.	-0.39	-0.42	.	.	.	-0.42
		hm net beta	-0.92	-0.93	-0.28	.	-0.36	-1.64	.	.	.	-0.51
		tm net beta	0.57	0.71	0.12	.	-0.06	0.79	.	.	.	0.26
	Frankfurt	mean reversion	-0.43	-0.36	-0.44	-0.03	-0.45	.	-0.35	-0.36	-0.46	-0.43
		hm net beta	-0.84	0.01	-0.18	-0.20	-0.21	.	-0.41	0.08	-0.53	-0.47
		tm net beta	0.60	0.38	0.08	0.97	0.15	.	0.32	0.09	-1.57	0.33
	London	mean reversion	-0.33	-0.25	-0.40	-0.18	-0.32	.	-0.22	-0.33	.	-0.35
		hm net beta	-0.73	-0.17	-0.15	0.08	-0.22	.	-0.27	-0.04	.	-0.29
		tm net beta	0.48	0.16	0.00	0.81	-0.05	.	0.27	0.05	.	0.15
	Luxembourg	mean reversion	.	.	-0.44	.	.	.	-0.50	.	.	-0.45
		hm net beta	.	.	-0.25	.	.	.	-0.45	.	.	-0.27
		tm net beta	.	.	0.08	.	.	.	1.00	.	.	0.19
	Oslo	mean reversion	-0.35	.	-0.40	.	.	.	.	.	.	-0.37
		hm net beta	-0.56	.	-0.12	.	.	.	.	.	.	-0.34
		tm net beta	0.48	.	0.10	.	.	.	.	.	.	0.29
	Swiss	mean reversion	-0.44	-0.44	-0.47	.	-0.43	.	.	.	.	-0.45
		hm net beta	-0.89	-0.59	-0.39	.	-0.27	.	.	.	.	-0.64
		tm net beta	0.67	0.58	0.23	.	-0.20	.	.	.	.	0.45
	Johannesburg	mean reversion	-0.30	-0.21	-0.40	.	.	.	.	.	.	-0.38
		hm net beta	-0.95	-0.68	-0.34	.	.	.	.	.	.	-0.44
		tm net beta	0.55	0.61	0.24	.	.	.	.	.	.	0.30
Sample mean		mean reversion	-0.40						-0.27			-0.38
		hm net beta	-0.37						-0.09			-0.32
		tm net beta	0.32						0.40			0.33

Table 3.5

Table 3.5 reports summary statistics of firm-level factors by target market. Our sample includes 1,666 cross-listed securities between 2001 and 2010. For each target market, individual cell in Table 3.5 represents the average value of each firm-level variable.

Summary statistics of firm-level factors

		firm-level factors								
	target market	IO(hc)	IO(tc)	size	mrkt. cap.	hm analyst estimates	hm security illiquidity	tm security illiquidity	hm share of trading volume	tm share of trading volume
Asia	Australia	13.2	0.4	13.7	6.8	8.0	0.5	2.0	0.71	0.24
	Hong Kong	3.9	1.4	15.3	8.0	7.0	0.0	0.0	0.62	0.35
	Singapore	1.6	0.5	13.3	5.8	7.5	8.4	0.8	0.67	0.33
	Taiwan	4.8	0.2	12.6	5.3	6.4	0.7	0.1	0.37	0.63
	Tokyo	22.5	0.1	18.8	10.7	22.0	0.0	0.9	0.88	0.02
America	Lima	12.2	0.0	14.6	7.4	19.0	0.3	0.2	0.73	0.22
	NASDAQ	6.2	19.5	12.9	6.1	8.4	0.6	12.7	0.49	0.51
	New York	7.6	14.7	15.5	8.1	12.8	0.2	0.1	0.61	0.37
	Toronto	23.1	4.8	12.5	5.9	5.6	0.7	2.1	0.76	0.22
Europe & Africa	Euronext Amsterdam	7.6	1.0	16.2	8.6	20.3	5.4	1.1	0.66	0.23
	Euronext Brussels	18.0	0.2	17.3	9.7	21.9	0.1	0.8	0.79	0.08
	Euronext Lisbon	2.5	0.0	19.6	10.4	28.1	0.0	0.0	0.97	0.00
	Euronext Paris	22.0	0.9	17.1	9.7	18.9	0.0	5.1	0.83	0.06
	Frankfurt	27.7	0.6	15.6	8.1	15.8	0.1	1.7	0.90	0.05
	London	7.3	3.1	14.5	7.4	12.0	3.1	4.5	0.68	0.27
	Luxembourg	4.0	0.0	15.8	8.1	18.8	0.1	0.3	0.86	0.13
	Oslo	18.9	5.6	13.1	6.1	7.9	10.0	0.4	0.50	0.49
	Swiss	34.3	0.3	17.5	10.2	24.2	0.0	0.5	0.87	0.03
	Johannesburg	5.2	2.4	15.4	8.0	9.2	0.0	0.4	0.68	0.25
Sample	mean	12.1	9.0	15.2	7.9	13.7	0.8	2.7	0.67	0.29
	standard deviation	20.9	14.2	2.8	2.4	10.6	16.0	96.5	0.29	0.29
	25th percentile	0.0	0.3	13.2	6.1	4.8	0.0	0.0	0.44	0.03
	50th percentile	1.8	2.3	15.4	8.1	11.5	0.0	0.0	0.76	0.17
	75th percentile	12.6	11.3	17.3	9.8	20.1	0.0	0.2	0.94	0.50

Table 3.6

Table 3.6 reports summary statistics of market-level factors by target market. Our sample includes 1,666 cross-listed securities between 2001 and 2010. For each target market, individual cell in Table 3.6 represents the average value of each market-level variable.

Summary statistics of market-level factors

		market-level factors											
	target market	geographical distance	time-zone difference	hm transaction cost	tm transaction cost	hm mrkt. cap. -to-GDP	tm mrkt. cap. -to-GDP	hm inv. protection	tm inv. protection	hm exchange trading rule	tm exchange trading rule	hm short sale restriction	tm short sale restriction
Asia	Australia	8.4	8.6	34.3	29.4	0.8	1.0	7.6	6.9	14.2	8.0	0.3	0.3
	Hong Kong	6.2	0.7	46.3	38.3	0.4	4.9	4.1	8.6	7.8	7.0	0.9	0.3
	Singapore	7.7	1.4	40.0	36.6	2.1	1.6	6.9	7.7	8.1	11.0	0.4	0.3
	Taiwan	7.1	0.8	32.4	45.1	3.8	1.0	8.2	5.7	8.8	2.0	0.4	0.6
	Tokyo	8.5	9.0	31.0	18.9	1.2	0.7	6.5	6.9	14.2	3.0	0.1	0.2
America	Lima	8.3	1.3	25.3	70.7	0.9	0.4	9.1	4.3	17.9	0.0	0.1	0.7
	NASDAQ	7.5	4.0	35.1	23.6	0.8	1.0	7.2	10.0	10.2	26.0	0.2	0.0
	New York	7.5	4.1	37.0	23.0	0.8	1.0	6.8	10.0	10.0	23.0	0.2	0.0
	Toronto	7.0	4.7	25.2	26.3	1.0	0.9	8.6	9.7	18.4	15.0	0.1	0.0
Europe & Africa	Euronext Amsterdam	5.9	0.9	31.6	24.8	0.9	0.9	4.7	4.9	11.2	7.9	0.2	0.0
	Euronext Brussels	6.1	1.7	30.0	29.0	0.9	0.6	5.7	0.5	9.9	6.1	0.1	0.0
	Euronext Lisbon	5.7	1.0	28.6	27.7	0.6	0.4	6.0	4.6	9.8	8.8	0.7	0.7
	Euronext Paris	6.9	2.8	31.4	27.1	0.9	0.7	6.7	4.2	12.9	6.7	0.1	0.2
	Frankfurt	7.1	3.4	29.4	26.2	1.0	0.4	6.9	0.1	14.8	5.3	0.1	0.2
	London	7.1	3.6	44.0	46.4	0.8	1.2	6.8	8.3	10.0	14.7	0.3	0.0
	Luxembourg	5.6	0.6	32.7	45.6	0.7	0.8	4.8	.	5.9	.	0.2	0.5
	Oslo	7.1	3.2	30.5	28.9	1.0	0.5	7.7	5.5	15.9	10.2	0.1	0.0
	Swiss	7.0	3.2	26.9	28.1	0.8	2.3	6.3	3.6	14.5	9.4	0.1	0.2
	Johannesburg	8.7	3.0	40.1	42.9	1.2	1.0	8.1	8.3	14.4	.	0.0	0.3
Sample	mean	7.3	3.7	35.3	28.3	0.9	1.2	6.7	7.7	11.3	16.5	0.2	0.1
	standard deviation	1.4	4.3	16.2	10.8	0.6	1.0	3.0	3.2	6.8	8.1	0.4	0.2
	25th percentile	5.8	0.0	22.9	18.9	0.5	0.9	4.2	5.5	5.0	8.0	0.0	0.0
	50th percentile	8.2	2.0	31.2	28.6	0.8	1.0	6.9	9.7	14.0	23.0	0.0	0.0
	75th percentile	8.5	6.0	43.7	34.2	1.0	1.2	9.7	10.0	15.0	23.0	0.5	0.0

Table 3.7

Table 3.7 reports the preliminary regression results. The annual panel includes 7,112 observations (firm-target market-year) for 1,164 cross-listed firms from 2001 to 2010. The regressions are estimated using the pooled OLS method. The dependent variable for Model (1), (2), and (3) is the home market excess comovement net beta obtained from estimating the time-series regression specification in (2). The dependent variable for model (4) through (6) is the target market excess comovement net beta obtained from estimating (2). Model (2) and (4) include year fixed-effects. Model (3) and (6) include both home and target market fixed-effects in addition to year fixed effects. *IO(hc)* and *IO(tc)* are the percentage of market capitalization owned by institutional investors domiciled in the home country and the target country, respectively. The *geographical distance* is the natural logarithm of the distance in miles between the cities in which the home market and the target market are located. The reported standard errors are robust to clustering by firm.

Preliminary regression results

	home market net beta			target market net beta		
	(1)	(2)	(3)	(4)	(5)	(6)
geo. distance	-0.1165***	-0.1168***	-0.1636***	0.1334***	0.1337***	0.1564***
	[0.007]	[0.007]	[0.012]	[0.008]	[0.008]	[0.013]
IO(hc)	-0.0073***	-0.0074***	-0.0026***			
	[0.001]	[0.001]	[0.001]			
IO(tc)				0.0001	-0.0003	0.0009**
				[0.001]	[0.001]	[0.000]
Year fixed-effects	No	Yes	Yes	No	Yes	Yes
Home market fixed-effects	No	No	Yes	No	No	Yes
Target market fixed-effects	No	No	Yes	No	No	Yes
Adjusted r-squared	0.19	0.20	0.34	0.14	0.15	0.28
Observations	7,112	7,112	7,112	7,112	7,112	7,112
Number of Firms	1164	1164	1164	1164	1164	1164

Standard errors are clustered at firm level; *** p<0.01, ** p<0.05, * p<0.1

Table 3.8: Panel A

Table 3.8 reports the main regression results. The annual panel includes 6,600 observations (firm-target market-year) for 1,107 cross-listed firms from 2001 to 2010. The regressions are estimated using the pooled OLS method. The dependent variable for model (1), (2), and (3) is the home market excess comovement net beta obtained from estimating the time-series regression specification in (2). The dependent variable for model (4) through (6) is the target market excess comovement net beta obtained from estimating (2). Model (1) and (4) are estimated using the overall sample. The regression estimates from Model (2) and Model (5) are obtained using a sample of US cross-listed stocks. Model (3) and (6) are estimated with a sample of non-U.S. cross-listings. All models in Table 8 include the following fixed-effects: year-fixed effects, home and target market region fixed-effects, home and target market emerging market indicator variables. *IO(hc)* and *IO(tc)* are the key variables, and are the percentage of market capitalization owned by institutional investors domiciled in the home country and the target country, respectively. The reported standard errors are robust to clustering by firm.

Main regression results

	home market net beta			target market net beta		
	All	US target	Non-US target	All	US target	Non-US target
	(1)	(2)	(3)	(4)	(5)	(6)
size	-0.0201***	-0.0261***	-0.0161***	0.0253***	0.0201***	0.0180***
	[0.004]	[0.005]	[0.006]	[0.004]	[0.004]	[0.006]
hm security illiquidity	-0.0003	0.0042***	-0.0005	0.0010**	-0.0026*	0.0011***
	[0.001]	[0.001]	[0.001]	[0.000]	[0.001]	[0.000]
tm security illiquidity	-0.0018***	-0.0111***	-0.0015**	-0.001	-0.0008	-0.0012
	[0.001]	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]
geo. distance	-0.1572***	-0.0971***	-0.1116***	0.1408***	-0.1169***	0.1112***
	[0.007]	[0.034]	[0.014]	[0.008]	[0.022]	[0.014]
hm transaction cost	0.0023***	0.0040**	-0.0016	-0.0016*	-0.0016	0.0042***
	[0.001]	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]
tm transaction cost	0.0067***		0.0091***	-0.0062***		-0.0059***
	[0.002]		[0.002]	[0.002]		[0.002]
hm mrkt. cap.-to-GDP	-0.0260*	-0.0300*	-0.0326*	0.0212	0.0594***	0.0562***
	[0.014]	[0.016]	[0.018]	[0.015]	[0.020]	[0.022]
tm mrkt. cap.-to-GDP	-0.0432***		-0.0043	0.0872***		0.0503***
	[0.011]		[0.015]	[0.011]		[0.013]
hm inv. protection	-0.0038	-0.0198**	0.0406***	0.0236***	0.0032	-0.0334***
	[0.006]	[0.008]	[0.010]	[0.007]	[0.006]	[0.009]
tm inv. protection	-0.008		-0.0147	-0.0182**		-0.0114
	[0.009]		[0.009]	[0.008]		[0.008]
hm short sale restriction	-0.0475	-0.1120***	0.0733	0.0012	0.0668***	-0.0519
	[0.032]	[0.043]	[0.048]	[0.030]	[0.025]	[0.048]
tm short sale restriction	0.1325**		0.1577**	-0.2285***		-0.0549
	[0.063]		[0.073]	[0.057]		[0.074]
IO(hc)	-0.0037***	0.0022***	-0.0031***			
	[0.001]	[0.001]	[0.001]			
IO(tc)				0.0004	0.0007	-0.0028
				[0.001]	[0.000]	[0.004]
Year fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Home market region fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Target market region fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Home market emerging market indicator	Yes	Yes	Yes	Yes	Yes	Yes
Target market emerging market indicator	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted r-squared	0.25	0.24	0.28	0.22	0.49	0.15
Observations	6,600	3,475	3,125	6,600	3,475	3,125
Number of Firms	1,107	567	625	1,107	567	625

Standard errors are clustered at firm level; *** p<0.01, ** p<0.05, * p<0.1

Table 3.8: Panel B

Table 3.8 reports the main regression results. The annual panel includes 6,600 observations (firm-target market-year) for 1,107 cross-listed firms from 2001 to 2010. The regressions are estimated using the pooled OLS method. The dependent variable for model (7) and (8) is the home market excess comovement net beta obtained from estimating the time-series regression specification in (2). The dependent variable for model (9) and (10) is the target market excess comovement net beta obtained from estimating (2). The sample for Model (7) and (9) is the cross-listed-home-market-share pairs with synchronous trading hours. Model (8) and (10) are estimated using a sample of the pairs with non-synchronous trading hours. All models in Table 8 include the following fixed-effects: year-fixed effects, home and target market region fixed-effects, home and target market emerging market indicator variables. *IO(hc)* and *IO(tc)* are the key variables, and are the percentage of market capitalization owned by institutional investors domiciled in the home country and the target country, respectively. The reported standard errors are robust to clustering by firm.

Main regression results

	home market net beta		target market net beta	
	Synchronous	Non-synchronous	Synchronous	Non-synchronous
	(7)	(8)	(9)	(10)
size	-0.0069	-0.0311***	0.0095**	0.0336***
	[0.004]	[0.006]	[0.004]	[0.006]
hm security illiquidity	0.0009***	-0.0007	0.0015	0.0010**
	[0.000]	[0.001]	[0.001]	[0.000]
tm security illiquidity	-0.0019***	-0.0015	0.0017**	-0.0036***
	[0.000]	[0.001]	[0.001]	[0.001]
geo. distance	-0.0397***	-0.1363***	0.0007	0.1348***
	[0.013]	[0.042]	[0.013]	[0.037]
hm transaction cost	0.001	0.0044***	0.0016*	-0.0055***
	[0.001]	[0.001]	[0.001]	[0.001]
tm transaction cost	0.0056***	0.0063*	-0.0050***	-0.0073**
	[0.002]	[0.003]	[0.002]	[0.003]
hm mrkt. cap.-to-GDP	0.0147	-0.0108	-0.0121	0.0304*
	[0.026]	[0.017]	[0.022]	[0.018]
tm mrkt. cap.-to-GDP	0.0021	0.0206	0.0462***	0.0201
	[0.019]	[0.027]	[0.016]	[0.022]
hm inv. protection	0.0306***	-0.0430***	-0.0236***	0.0545***
	[0.008]	[0.009]	[0.008]	[0.008]
tm inv. protection	-0.0153*	-0.0141	-0.0047	-0.0228
	[0.008]	[0.016]	[0.008]	[0.015]
hm short sale restriction	0.0738	-0.1700***	-0.0509	0.0981***
	[0.058]	[0.039]	[0.049]	[0.033]
tm short sale restriction	0.0999*	0.0911	-0.1883***	-0.148
	[0.055]	[0.110]	[0.057]	[0.097]
IO(hc)	-0.0012**	-0.0035***		
	[0.001]	[0.001]		
IO(tc)			0.0010***	0.0013
			[0.000]	[0.001]
Year fixed-effects	Yes	Yes	Yes	Yes
Home market region fixed-effects	Yes	Yes	Yes	Yes
Target market region fixed-effects	Yes	Yes	Yes	Yes
Home market emerging market indicator	Yes	Yes	Yes	Yes
Target market emerging market indicator	Yes	Yes	Yes	Yes
Adjusted r-squared	0.13	0.21	0.11	0.14
Observations	2,978	3,622	2,978	3,622
Number of Firms	564	622	564	622

Standard errors are clustered at firm level; *** p<0.01, ** p<0.05, * p<0.1

Table 3.9

Table 3.9 reports summary statistics of estimated regression coefficients obtained by estimating (2) using weekly return series. We measure weekly returns from Wednesday to Wednesday to reduce any potential noise from Monday or Friday effects. Using weekly returns, we re-estimate time-series regressions specified in (2) without the lead and lag terms on returns to obtain weekly beta estimates. Given a sample year and for each cross-listed-home-market-share pair, we require 12 weekly return observations in estimating (2). In comparison with Table 3.3, we observe that the distribution of mean-reversion coefficients estimated using weekly returns is similar the distribution of mean-reversion coefficients estimated using daily return series. Clearly, we note that the absolute size of the estimated coefficients using weekly returns on target market and home market returns are smaller than those estimated using daily return data.

Estimated weekly betas

N = 8,990	intercept	mean reversion coeffcient	hm net beta coeffcient	tm net beta coeffcient	fx net beta coeffcient
mean	0.000	-0.37	-0.14	0.20	-0.23
standard deviation	0.006	0.19	0.50	0.52	33.70
10th percentile	-0.004	-0.58	-0.65	-0.22	-0.89
25th percentile	-0.001	-0.50	-0.34	-0.01	-0.29
50th percentile	0.000	-0.39	-0.10	0.14	0.00
75th percentile	0.001	-0.27	0.05	0.40	0.28
90th percentile	0.004	-0.14	0.27	0.71	0.89

Table 3.10

Table 3.10 reports panel regression results based on weekly beta estimates. The annual panel includes 6,640 observations (firm-target market-year) for 1,113 firms with cross-listed securities on 19 target markets over the span of 2001 and 2010. We estimate pooled OLS regressions. Furthermore, we cluster standard errors by firm. In Table 9, the dependent variables are excess comovement home market net beta and excess comovement target market net beta for Model (1) and (2), respectively. For Model (1) and (2) in Table 3.9, we include year, home and target emerging market, home and target market region fixed-effects. We also include emerging market indicator variables for home and target markets to capture the potential effect of capital control and foreign investment restrictions.

Regression results using weekly data

	home market beta	target market beta
	All	All
	(1)	(2)
size	-0.0059*	0.0098***
	[0.003]	[0.003]
hm security illiquidity	0.0010**	-0.0021
	[0.000]	[0.001]
tm security illiquidity	0.0004	-0.001
	[0.001]	[0.001]
geo. distance	-0.1005***	0.0818***
	[0.006]	[0.006]
hm transaction cost	0.0005	-0.0005
	[0.001]	[0.001]
tm transaction cost	0.0029**	-0.0066***
	[0.001]	[0.002]
hm mrkt. cap.-to-GDP	-0.0124	0.0174
	[0.009]	[0.011]
tm mrkt. cap.-to-GDP	-0.0108	0.0867***
	[0.009]	[0.011]
hm inv. protection	-0.0069*	0.0143***
	[0.004]	[0.004]
tm inv. protection	-0.0034	0.0007
	[0.006]	[0.006]
hm short sale restriction	0.0328	-0.0089
	[0.022]	[0.024]
tm short sale restriction	0.0379	-0.1247***
	[0.046]	[0.047]
IO(hc)	-0.0014***	
	[0.001]	
IO(tc)		0.0007*
		[0.000]
Year fixed-effects	Yes	Yes
Home market region fixed-effects	Yes	Yes
Target market region fixed-effects	Yes	Yes
Home market emerging market indicator	Yes	Yes
Target market emerging market indicator	Yes	Yes
Adjusted r-squared	0.13	0.11
Observations	6,640	6,640
Number of Firms	1,113	1,113

Standard errors are clustered at firm level; *** p<0.01, ** p<0.05, * p<0.1